

Clinton County Compost Facility Plattsburgh, New York

Operations and Maintenance Manual

September 2009

Report

Clinton County Biosolids Processing Facility
Plattsburgh, NY

Alkaline Treatment Process

Operations and Maintenance Manual

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1.0 INTRODUCTION

This Operations and Maintenance Manual is for the Alkaline Treatment process component at the Clinton County Composting Facility in Plattsburgh, New York. Processing steps are described in detail so that operators can optimize treatment, producing a useful end product, while protecting public health and the environment. Processing monitoring for operations and for regulatory purposes is also described, and forms are provided for tracking processing, for record keeping and for reporting.

Other information is included in the manual. Basic definitions for the Alkaline Treatment process are in Appendix A, and useful conversion factors are listed in Appendix B. In addition, Material Safety Data Sheets for the various materials used for Alkaline Treatment Processing have been added, along with information on safe handling of biosolids.

2.0 The Alkaline Treatment Process

The Alkaline Treatment Process is similar to other methods involving mixing biosolids with alkaline materials such as lime. The process is a type of chemical stabilization, described by New York State Department of Environmental Conservation (NYSDEC) (1999) as follows:

Chemical stabilization is a process in which chemicals are mixed with sludge to achieve a Class A level of treatment. Alkaline materials, such as lime or cement kiln dust, are added to dewatered biosolids. The chemical react with the biosolids and generate heat and increase the pH of the biosolids. The combination of heat and high pH serves to eliminate viable pathogenic organisms. Due to the lime addition, the resultant product is used primarily as a lime substitute in agriculture. These facilities are relatively simple, consisting of storage facilities, mixing equipment, and an area where the material is allowed to cure.

In summary, at the Clinton County Biosolids Processing Facility, alkaline materials are added to biosolids to keep the pH above 12 for at least 72 hours. All sludge received is dewatered, such that no dewatering will be required at the facility. During the 72 hour period, the temperature of the mixture must be at least 52 degrees C for at least 12 hours. (The exothermic reaction results from mixing the alkaline material with the

biosolids. External heat sources are not required). Admixture is added during processing to result in a final mixture with a total solids concentration of at least 50%.

A soil shredder, commonly applied for spreading topsoil and other landscaping purposes, is then used for additional processing. Shredding further dries the mixture, and helps produce a final product soil-like in appearance and texture, aiding final product distribution and sale.

As discussed above, the combination of high pH and elevated temperatures over sufficient time inactivates pathogens to below-detectable levels. However, the process is reported to permit survival of microflora, important for long-term odor control and soil fertility, and helps prevent odor production and product pH values decline.

Alkaline Treatment processing to meet PFRP requirements as detailed above simultaneously meets EPA Vector Attraction Reduction (VAR) requirements under Alternative 2, Addition of Alkali, in 40 CFR 503.32, which states:

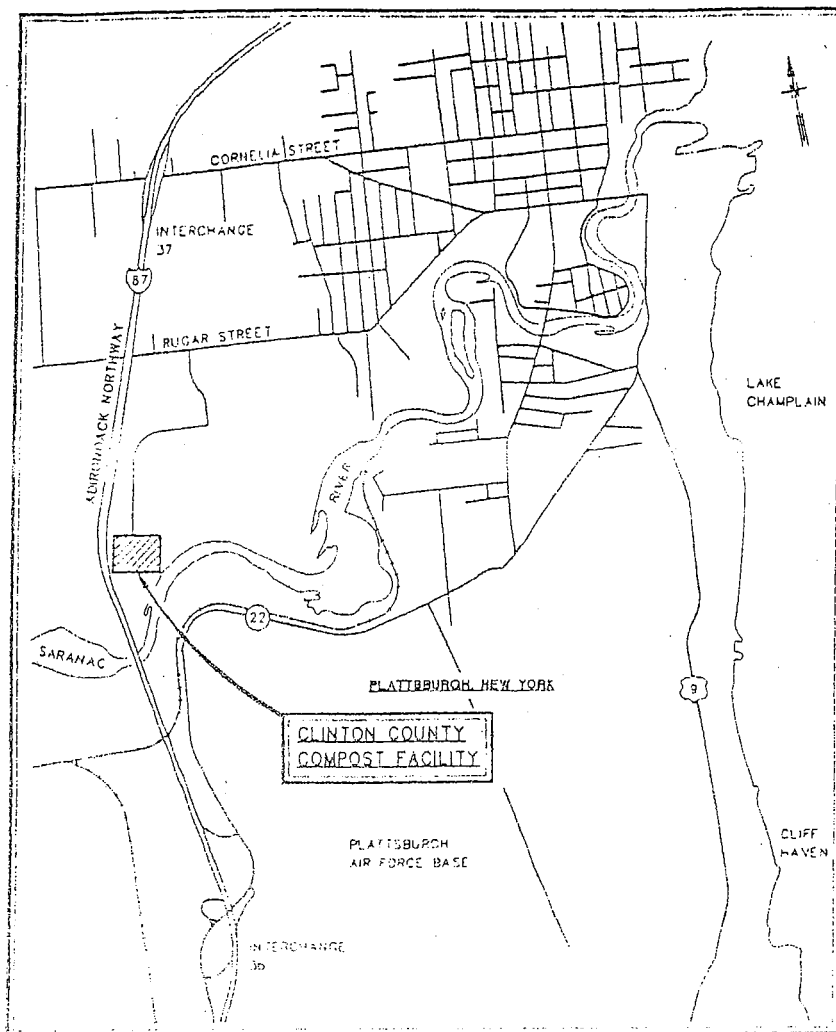
The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for two hours and then at 11.5 or higher for an additional 22 hours.

3.0 Processing Equipment and Operating Steps

The location of the Alkaline Treatment processing component of the facility is shown in Figure 1, while the layout of the equipment is shown in Figure 2. The processing steps are details in the process flow diagram, Figure 3. Three 1400 cu ft. silos store the alkaline admixtures: one each for lime, Fly Ash (FA), and Lime Kiln Dust (LKD). Each of these silos has a dry chemical feeder using a screw auger to move the material at controlled rates. A fourth silo (sometimes called a “pig”), holding 4,000 cu. Ft. of material, may be provided for backup. This backup silo can be filled by suppliers with any of the alkaline mixtures, which can then be fed to the corresponding silo-feeder unit.

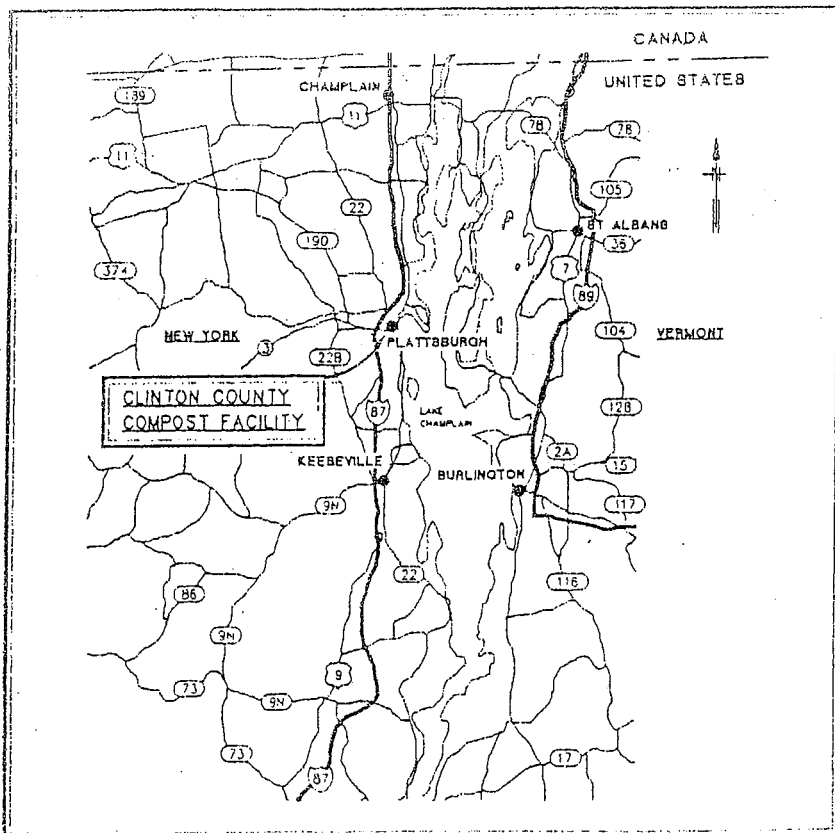
A schematic of the feed silos is shown in Figure 4. Further details on silo and feeder operations are provided in Appendix C and in the silo manufacturer’s literature.

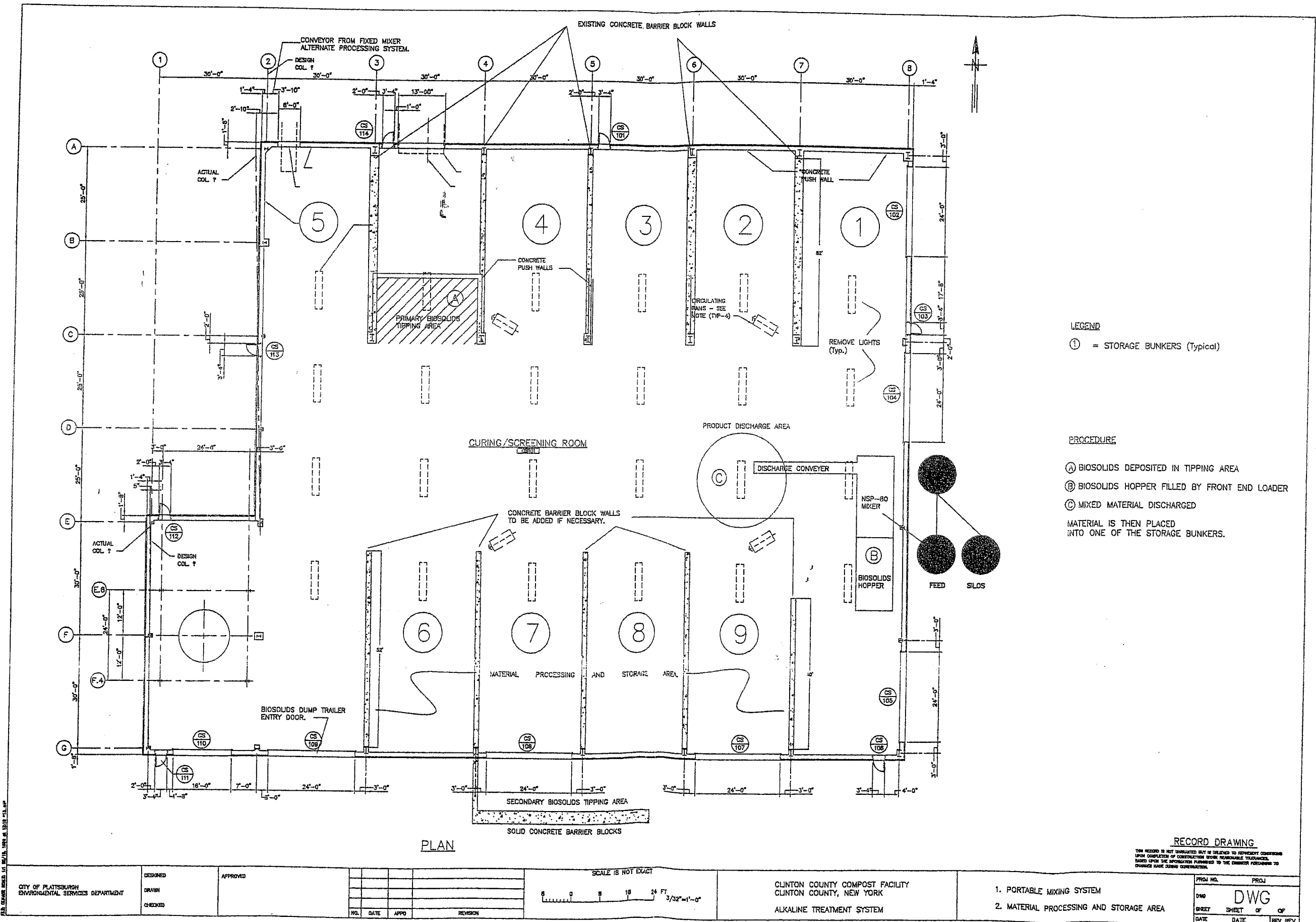
FIGURE 1



LOCATION MAP

1 MILE 1/2 MILE 0 1 MILES





ALKALINE
ADMIXTURE
1 TANKER/DAY

FIGURE 3

BIOSOLIDS
2 TRUCKS/DAY

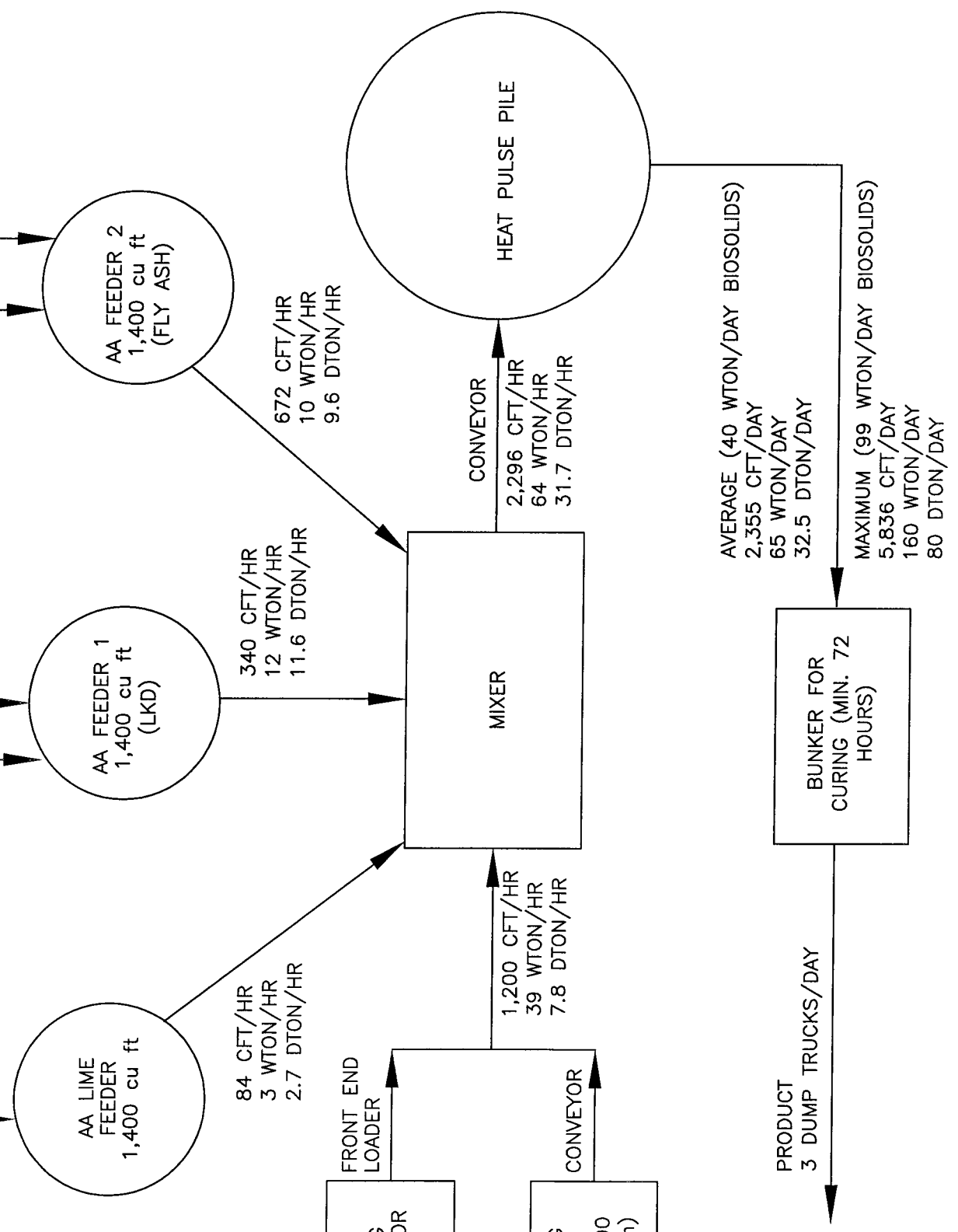


FIGURE 4 PROCESS FLOW CHART FOR CLINTON COUNTY BIOSOLIDS PROCESSING FACILITY

Key:

- 1. Baghouse Filter Vent
- 2. Silo
- 3. Rotary Vane
- 4. Isolation Gate Valve
- 5. Inclined Screw Conveyor

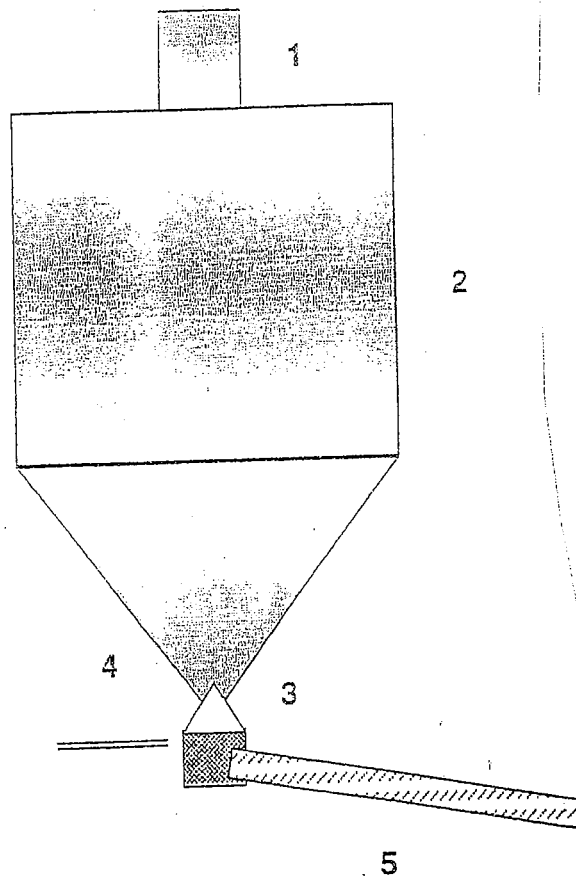


Figure 4. Schematic of storage silo and feeder.

The lime and alkaline admixtures are added to the biosolids to achieve pH, temperature, and final total solids requirements. Fly ash addition helps adjust the final total solids concentration, helps control odors (due to its high surface area), and improves final product characteristics such as color and texture. (When new batches of admixture or biosolids from new sources are being treated, dosages are adjusted as necessary to meet treatment requirements).

Alkaline admixture (AA) dosages usually range from 20 to 60% of the biosolids mass, on a wet basis. Dosages depend on amounts needed to meet temperature and pH requirements, and the desired total solids concentration of the resulting mixture. At the Clinton County biosolids Processing Facility, a total solids concentration greater than 50% is targeted.

Alkaline Treatment processing involves moving biosolids from the receiving bins (using a conveyor) or from the receiving room floor (using a front end loader) to a mixer, where they are combined with lime and one or both of the alkaline mixtures. The mixing unit is an NSP-80 unit, manufactured by Cemen-Tech. Chemical feed rates, and the accompanying biosolids feed rates to the mixer, are listed in Table 1.

Table 1. Alkaline Treatment Process Feed Rates

Feeder	Storage Volume	Minimum Feed Rate	Average Feed Rate	Maximum Feed Rate
Biosolids Feed Rate	N/A	400	1200	2000
Lime Feeder	1400	40	120	200
Alkaline Admixture Feeders 1&2	1400	212	636	1061

Average feed rates listed in Table 1 are approximate values for meeting the required treatment conditions. Experience with equipment, admixtures, and the biosolids being processed are needed to ensure that these requirements are met. At the average biosolids feed rate in Table 1, the permitted quantity of biosolids, 40 wet tons per day, which is about 1,440 cu. ft. in volume, can be processed in about 1 hour. The final volume of material will be larger in volume than the starting biosolids, so that about 2,318 cu. ft. of the mixture results.

After mixing, the material is sent by a conveyor to Heat Pulse Pile 1, as shown in Figure 3. The mixture is monitored for pH, solids content, and temperature as detailed below. As needed to make room for new batches, the solids in Heat Pulse Pile 1 are moved, using a front end loader, to the bays in the Alkaline Treatment processing area.

A moveable soil shredder is used to further process the material to produce a marketable product, as described above. The shredder is a Model 466 Soil Shredder-Mixer made by Royer Industries, used for processing soil, peat, and other organic materials. Information on this shredder at the facility is provided in Appendix D. See the shredder manufacturer's literature for further details on the unit.

3.1 Operations and Process Monitoring Procedures

For detailed instructions on each equipment item, please refer to manufacturers' manuals. Forms for recording process monitoring and regulatory reporting information are provided in Appendices E and F. Step-by-step operations and monitoring procedures for treating biosolids using the Alkaline Treatment process at the facility are as follows:

1. Receive dewatered biosolids at either the live-bottom receiving bins, or off-loaded onto the floor of the building housing the Alkaline Treatment area. Record biosolids source and volume received.
2. Inspect all equipment before start-up. Verify:
 - Mixer and conveyor status and operation
 - That silos levels indicate sufficient admixture quantities for the run
 - Alkaline admixture and lime feed rate settings.
3. Start-up the conveyor, or use a front-end loader, to route biosolids cake to the mixer receiving hopper.

4. Adjust the discharge conveyor to send the mixture to the Heat Pulse Pile 1 area (see Figures 2 and 3).
5. Start the alkaline admixture (AA) feeders and adjust to 12% of predetermined dose rates.

NOTE: Feed rate will be known from previous batches. Initial approximate average feed rates for start-up of the new facility will be determined by lab testing and prior experience and are listed in Table 1.

Feed rate modifications should be made, as needed, when biosolids from new sources are delivered, or when admixtures from new sources are supplied. Proper feed rates are set by monitoring to make sure time, temperature, pH and total solids requirements are met. Refer to Section 3.2 for information on calculating the admixture dosage to result in final total solids concentration of at least 50%.

6. Start-up the mixture and adjust to desired rate.
7. Reduce AA feeds to desired dosage rates after steady operation is attained.
8. Maintain sludge feed to mixer, as needed, using conveyor or front end loader.
9. Visually observe the mix and adjust feeds to achieve a consistent discharge.
10. Discharge into Pile 1 (see Figures 2 and 3), transferring material as needed, with the front end loader to other bin areas in the Alkaline Treatment area, shown in Figure 2.
11. Visually observe discharge product color and consistency.
12. After about 1 hour at average sludge feed rate (See Table 1), the mix batch is complete. Record batch date, time and number on the form (See Appendix E).
13. Monitor and record temperature and pH of batch.

Insert temperature probe in the material and monitor temperature until it stabilizes. (Temperature is measured in at least three different locations, using a temperature probe). It is expected that the temperature will increase to about 52 degrees C within about one hour. Begin to record temperature and time after the temperature reaches 52 degrees C. (See operations recording forms in Appendix E).

Collect five separate grab samples (from at least one foot deep) from widely different locations in the pile, mix, measure, and record pH and total solids concentrations.

14. Process objectives are as follows:
 - Maintain the mixture temperature at a minimum value of 52 degrees C for 12 hours (optimally between 52 degrees C – 62 degrees C).
 - Maintain the pH 12 for at least 72 hours.
 - The final total solids concentration should be at least 50%.
15. Monitor and record the temperature of the batch for 12 hours. (Temperature is measured in at least three different locations, using a temperature probe).
16. Reprocess or divert the batch to disposal if temperatures are not kept above 52 degrees C for at least 12 hours.
17. Move pile with front end loader, as needed, to make room for the next batch. At the end of 72 hours, collect five (5) separate grab samples (from at least one foot deep) from widely different locations in the pile, mix, measure, and record pH and total solids concentrations.
18. Take samples for testing fecal coliform (or salmonella) and heavy metals concentrations according to schedule shown on Table 4 based on the amount of product produced at the facility. Based on initial production estimates (using 40 wton/day of biosolids) it is anticipated that a total of 52 samples per year, or one per week will be necessary.
19. Product pickups are pre-arranged and scheduled by contract. Record appropriate details of pickup (date, time, batch numbers picked up).

3.2 Lime And Admixture Dosage

As discussed above, lime and admixtures are added to achieve temperature, pH, and total solids requirements. Dosages for meeting temperature and pH values are determined by experience. The targeted total solids concentration is 50%, which can be met as described below.

The required dosage (as mass of total admixture per unit mass of wet biosolids) to achieve a given total concentration can be calculated using Equation 1.

$$\text{Dose} = \frac{\text{Mix \%} - \text{Cake \%}}{100 \% - \text{Mix \%}}$$

where: Dose = Required AA dosage (to be calculated)
 Mix % = The desired total solids concentration of the mixture
 Cake % = The total solids concentration of the sludge cake.

For example: It is desired to achieve a total mixture solids concentration of 50% using sludge cake at 20% solids. From equation 1,

$$\text{Dose} = \frac{50 \% - 20 \%}{100 \% - 50 \%} = \frac{30 \%}{50 \%} = 60 \%$$

This calculation approach does not take into consideration the heat of hydration, causing exothermic reactions heating the mixture. The resulting increased temperatures increase evaporation. Therefore, dose levels result in total solids concentrations higher than the target Mix % value used in Equation 1.

4.0 PREVENTATIVE MAINTENANCE

Poor product quality frequently is the result of equipment malfunctions. In the Alkaline Treatment process, the most critical components that directly affect product quality are the mixer, shredding equipment, the metering conveyors, and the monitoring equipment. In addition, air emissions can result from inadequate maintenance of bag-house filters on the silos.

The key to good preventative maintenance (PM) is establishing and rigorously implementing PM schedules. This approach should be augmented with thorough record keeping, establishing maintenance personnel anticipate failures before they occur.

Preventive maintenance procedures should be established for each component of the Alkaline Treatment process. The PM sections of equipment manufacturers' manuals should be incorporated into the program.

5.0 EQUIPMENT PERFORMANCE RECORD KEEPING

Keeping careful records can help identify the sources(s) of a problem. The following list includes information useful to record:

- Admixture rations
- Temperature rise test of blended admixture (plotted in control chart)
- Biosolids feed rate (lb/min)
- Mixture RPM
- Texture of discharge from sludge processor (for example, dusty, granular, OK, pasty)
- % solids in mixer discharge
- pH of mixer discharge
- Date of calibration of metering screw conveyors using for transferring admixtures and lime
- Date of preventative maintenance on all system components

6.0 MONITORING PLAN

The Monitoring Plan includes performing the time, temperature, pH and total solids measurements detailed in the Operations and Process Monitoring Procedures above, using the forms in Appendix E. The forms must be kept on-hand to prove that both pathogen and vector attraction reduction requirements are met.

Other parameters must also be monitored and reported to the NYS DEC. These parameters include heavy metals and bacterial monitoring. The biosolids delivered to the facility must also meet monitoring requirements in state regulations. These monitoring and reporting requirements are detailed in this section.

Biosolids Sampling

Biosolids brought to the Clinton County Biosolids Processing facility must be from sources meeting NY State sampling and analysis requirements in NYCRR 360-5.10 Table 1. Parameters to be analyzed are listed in Table 2 below. The number of tests and required frequencies are given in Section 360-5.10 Table 6 and reproduced below in Table 3. Allowable maximum concentrations for biosolids and final product are provided in Table 6.

Table 2 Parameters for Biosolids Analysis

Parameter	Analytical Method¹	Max. Holding Temp/Time
Group A		
TKN	SM-4500-Norg	4°C (39.2°F)/28 days
Ammonia	SM-4500-NH3	4°C (39.2°F)/28 days
Nitrate	SM-4500-NO3	4°C (39.2°F)/28 days
Total Phosphorus	SM-4500-P	4°C (39.2°F)/28 days
Total Potassium	SW-6010 or 7610	4°C (39.2°F)/6 months
pH	SW-9045	
Total Solids	SM-2540 G	4°C (39.2°F)/7 days
Total Volatile Solids	SM-2540 G	4°C (39.2°F)/7 days
Group B		
Arsenic	SW-6010/ 7060/ 7061	4°C (39.2°F)/6 months
Cadmium	SW-6010/7130/7131	4°C (39.2°F)/6 months
Chromium (total)	SW-6010/7190/7191	4°C (39.2°F)/6 months
Copper	SW-6061/7210	4°C (39.2°F)/6 months
Lead	SW-6010/7420/7421	4°C (39.2°F)/6 months
Mercury	SW-7470/7471	4°C (39.2°F)/28 days
Molybdenum	SW-6010/7480/7481	4°C (39.2°F)/6 months
Nickel	SW-6010/7520	4°C (39.2°F)/6 months
Selenium	SW-6010/7740/7741	4°C (39.2°F)/6 months
Zinc	SW-6010/7950	4°C (39.2°F)/6 months
Group C		
Volatile Organic Compounds (VOCs) ²	SW-8260B	4°C (39.2°F)/14 days
Semivolatile Organics ²	SW-8270C	4°C (39.2°F)/14 days
Pesticides/PCBs ²	SW-8081/8082	4°C (39.2°F)/14 days

¹ Analytical methods: SM – Standard Methods for the Examination of Water and Wastewater; SW – Test Methods for Evaluating Solid Waste.

² A complete list of Group C compounds is provided in Appendix I.

Table 3 Testing¹ frequencies and number of analyses for sources of biosolids delivered to the Alkaline Treatment Facility

Biosolids Used (Dry Tons/Year)	Minimum Number of Analyses	
	Groups A & B	Group C
Greater than 1,000	12	1
200 to 1,000	6	1
25 to 199	4	1
Less than 25	2	0

¹ Each sample to be analyzed must be a composite of at least five separate grab samples, with no more than one grab sample collected in a 24 hour period. Analysis of nitrogen series (TKN, NH₃, and NO₃) must be performed on either grab samples or samples that are chilled to 4°C and remain chilled throughout the storage period. With the exception of pH, total solids, and total volatile solids, all results must be reported on a dry-weight basis.

Product Sampling

Sampling and testing of the final product must meet the applicable requirements of 6 NYCRR 360-5.5(e), and EPA regulations in 40 CFR 503. As required by 6 NYCRR 360.5.5(e), reports to the NYSDEC will be supplied, with samples taken and analyzed for reporting constituents listed in Table 8 at the frequencies given in Table 9 of Section 360-5.10. These requirements are reproduced in Tables 4 and 5 below.

Table 4 Parameters for Product Analysis

Parameter	Analytical Method ¹	Max. Holding Temp/Time
TKN	SM-4500-Norg	4°C (39.2°F)/28 days
Ammonia	SM-4500-NH ₃	4°C (39.2°F)/28 days
Nitrate	SM-4500-NO ₃	4°C (39.2°F)/28 days
Total Phosphorus	SM-4500-P	4°C (39.2°F)/28 days
Total Potassium	SW-6010 or 7610	4°C (39.2°F)/6 months
pH	SW-9045	
Total Solids	SM-2540 G	4°C (39.2°F)/7 days
Total Volatile Solids	SM-2540 G	4°C (39.2°F)/7 days

Parameter	Analytical Method ¹	Max. Holding Temp/Time
Arsenic	SW-6010/ 7060/ 7061	4°C (39.2°F)/6 months
Cadmium	SW-6010/7130/7131	4°C (39.2°F)/6 months
Chromium (total)	SW-6010/7190/7191	4°C (39.2°F)/6 months
Copper	SW-6061/7210	4°C (39.2°F)/6 months
Lead	SW-6010/7420/7421	4°C (39.2°F)/6 months
Mercury	SW-7470/7471	4°C (39.2°F)/28 days
Molybdenum	SW-6010/7480/7481	4°C (39.2°F)/6 months
Nickel	SW-6010/7520	4°C (39.2°F)/6 months
Selenium	SW-6010/7740/7741	4°C (39.2°F)/6 months
Zinc	SW-6010/7950	4°C (39.2°F)/6 months
Fecal coliform ²	SM-9221E/ EPA Methods 1680/1681	4°C (39.2°F)/6 hours
<i>Salmonella</i> sp. bacteria ²	SM-9260 D.1/ Kenner	4°C (39.2°F)/24 hours

¹ Analytical methods: SM – Standard Methods for the Examination of Water and Wastewater; SW – Test Methods for Evaluating Solid Waste.

² Analysis is required for either fecal coliform or *salmonella* sp. bacteria. See Section 6.1 below for additional information.

Table 5 Annual Product Testing Frequency

Average Product Generated (Cubic yards per day)	Number of Analyses
Greater than 50	52
5 to 50	12
Less than 5	6

¹ With the exception of pH, total solids, and total volatile solids, all results must be reported on a dry weight basis.

² Analysis of nitrogen compounds (TKN, NH₃, and NO₃) must be performed on grab samples or on samples that are immediately chilled to 4°C and remain chilled throughout the storage period.

As part of the Monitoring Plan, finished product concentration of arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium and zinc, expressed as milligrams per kilogram on a dry weight basis, shall be developed and retained for five years.

Allowable Pollutant Limits

Final product, biosolids and additional material amendments shall meet the pollutant limits set forth in Table 6 below. Final product that does not meet these limits shall not be distributed; the addition of sawdust, soil or other materials for dilution purposes is not allowed. Biosolids that do not meet the limits of Table 6 shall not be accepted at the facility; additional biosolids cannot be accepted from the biosolids generator until compliance with the requirements of NYCRR 360.5-5(c) and the limits in Table 6 below has been demonstrated for a period of at least 6 continuous months.

Table 6 Pollutant Limits

Parameter	Monthly Average Concentration, mg/kg dry weight	Maximum Concentration, mg/kg dry weight
Arsenic	41	75
Cadmium ¹	21 ² 10 ³	85
Chromium (total)	1000	1000
Copper	1500	4300
Lead	300	840
Mercury	10	57
Molybdenum	40	75
Nickel	200	420
Selenium	100	100
Zinc	2500	7500

¹ If the monthly average cadmium concentration exceeds 5 mg/kg, dry weight basis, the cadmium/zinc ratio must not exceed 0.015.

² Cadmium limit for biosolids and other amendments.

³ Cadmium limit for final product.

6.1 Microbiological Testing Requirements

As shown in Table 4, there are microbiological testing requirements for Class A biosolids, which must be met. As noted in EPA (1999), for Class A biosolids:

Either the density of fecal coliforms in the product must be less than 1,000 MPN per gram total solids (dry weight basis), or the density of Salmonella sp. Bacteria must be less than 3 MPN per 4 grams of total solids (dry weight basis). Time should be factored into the sampling program so that results can be obtained before biosolids are distributed for use or disposal. The 503 regulations do not specify a minimum number of samples per sampling event for Class A sludge, but it is strongly recommended that enough samples be taken to adequately represent the mass of material which is to be distributed.

NYCRR 360-5.5(e) requires demonstration of compliance with the pathogen and vector attraction reduction requirements; the anticipated monitoring program (using temperature, pH and solids content) is discussed in Section 3.1. Additionally, organism analysis will be performed at the frequencies required from Table 5 above.

In keeping with processing for meeting operational and microbiological testing requirements, the following statement, signed by the Facility Manager, shall be maintained at the facility:

I certify under penalty of law, that the information that will be used to determine compliance with the Class A pathogen requirements in 503.32(a) and the vector attraction reduction requirements in 503.33(b)6 was prepared under my direction in supervision and in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fines and imprisonment.

6.2 Admixture Monitoring

Metals concentrations in the admixtures are to be monitored. Grab samples should be taken and tested during each of the first three startup days; then one test per week will be conducted for a two week period, and then one test per month will be conducted for two months.

After startup, amendments approved by NYS DEC for the facility are to be monitored at least annually. If an amendment supplier has a change in coal or fuel source, a boiler or kiln shutdown, or other event that could change amendment characteristics, new testing

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and a new analytical history for the amendment is to be established. Testing of the final biosolids product will, of course, be the final evaluation step and product not meeting all regulatory requirements will not be marketed.

6.3 Annual Report

An annual report must be submitted to the NYSDEC no later than March 1 of each year, covering the previous calendar year, and providing the following documentation:

- All information and analyses of biosolids and product as required by Section 360-5.5(e);
- Type and quantity of waste, other materials such as bulking agents, including the source of the material;
- Process operational information including monitoring data and significant facility operational problems and any corrective actions;
- The quantity, by weight and volume, of product generated at the facility and the quantity of product and other solid waste (including unacceptable product) removed from the facility; and
- A description of the end-product distribution and disposal methods.

Additionally the report must include the following certification statement, which must be signed by an authorized representative of the facility and indicate the name and title of the individual signing:

“I certify, under penalty of law, that the information that will be used to determine compliance with the requirements in Subpart 360-5 of 6 NYCRR Part 360 has been prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment.”

7.0 PRODUCT NON-COMPLIANCE CONTINGENCIES

Batches not meeting the pathogen reduction requirement must be reprocessed and retested for fecal coli form or Salmonella sp. Otherwise, it will not be distributed for beneficial reuse. Samples not meeting the metals requirements will be disposed of at a regulated landfill as necessary.

8.0 TROUBLESHOOTING GUIDE

1. Sludge not discharging from the hopper into the blending auger:
 - Verify that power is reaching the unit. Check fuses.
 - Feed auger may be plugged, frozen or worn down.
 - Verify that auger is turning in the correct direction.

- Check quantity of sludge in hopper. If there is an insufficient amount of biosolids in the hopper, it will not discharge into the auger. An excess quantity of biosolids will plug the auger.
2. AA not discharging into Mix Unit:
- Check operation of transfer conveyor or screw.
 - Check operation of AA feeder.
 - Check position of isolation gate valve at silo.
 - Check level of AA in silo.
 - No air to air pads on silo.
 - Not enough air supply to pads.
 - Air pads plugged.
 - Refer to specific equipment manufactures manual.
3. Improper dosing of Alkaline Admixture:
- Check speed of feeder.
 - Check calibration of AA feeder.
 - Check calibration of sludge feed.
 - Recalculate/check desired dosage rate.
4. Mix unit not providing good mix.
- A. Discharging wet/plasticized material:
- Check for proper discharge of AA into mix unit.
 - Consider increasing AA dose rate, not to exceed calculated value.
 - Check solids content of dewatered cake entering mix unit.
 - Perform compatibility test to evaluate polymer.
- B. Discharging dry/dusty material:
- Check for proper discharge of AA into mix unit.
 - Check level of sludge in receiving and hopper.
 - Check operation of feed sludge conveyor to Mix Unit.
 - Consider reducing rate if appropriate.
 - Consider increasing sludge rate to mixer.
5. Excessive heat in cure/containment heat pulse phase:
- Check dose rate of hot AA for proper setting. Reduce rate if appropriate.
 - Contact City Environmental and modify AA mix flow rate to reduce CaO content and increase drying component content.
6. Low heat in cure/containment heat pulse phase:
- Check dose rate of hot AA for proper setting. Increase rate if appropriate.

- Contact City Environmental and modify AA mix flow rate to increase CaO content if they are too low.
 - Process batch as Alkaline Treatment Alternative #1.
7. Heat not maintained at cure pile extremities:
- Eliminate thin spots, locations less than 18" thick to minimize surface heat loss.
 - Cover pile with heat blanket.
 - Use side walls to contain piles.
 - Process under 24 hour heat pulse alternative.
8. Advanced alkaline stabilized cake not drying in 3-5 days:
- Check surface to mass ratio of windrow piles and reduce pile cross section.
 - Break down windrow piles and spread thin across drying pad.
 - Increase frequency of windrow turning if surface is dry.
 - Increase initial dose rate of AA to raise solids content of material to be piled and shredded. Literature recommends at least a 40% solids content in the mixer discharge. Material placed in piles with less than a 40% solids content may require more than 5 days to dry to 50% solids content.
9. Low pH before 72 hours:
- Check dose rate of AA for proper setting. Increase rate as appropriate.
 - Contact City Environmental Manager and modify AA mix to increase CaO content if appropriate.
 - Recycle the batch through the process.
 - Consider (with regulatory approval) disposing as a PSRP treated cake if the pH achieved a value of 12 for 2 hours.
10. Finished product not granular in appearance:
- Continue to shred to breakup clumps.
 - Continue to shred to increase solids content.
 - Check shredder device to assure unit is in proper working order.
 - Evaluate shredder device to assure it is capable of producing a granular product in accordance with manufacturer's literature.
11. Finished product has strong ammonia odor:
- Continue shredding to expose and oxidize trapped ammonia and other trapped odorous gases.
 - Continue to shred to reduce potentially odor laden moisture content of finished product.
 - Contact City Environmental Manager to discuss problems, such as those that could result from dust.

12. Odors on site are above acceptable limits:

- Evaluate modifications to mix designs.
 - Evaluate polymer used for sludge dewatering.
 - Evaluate feed sludge for septicity.
 - Evaluate processing schedules.
 - Evaluate housekeeping procedures.
 - Evaluate need for odor containment, controlled dispersion or odor control system.
13. Product compacts and forms clumps during storage;
- Decrease pile height to reduce compression.
 - Granulate material with shredder just before load out.
 - Contact City Environmental Manager to discuss.
14. Product sticks to transfer vehicles or spreaders:
- Increase solids content of product through additional shredding to 65 – 70%.
 - Granulate product just before load out.
 - Place sand, straw or sawdust in bottom of truck for long distance hauls (over 50 miles).
 - Evaluate internal surface of container or trailer for pitting and material compatibility.
 - Coat surfaces where sticking occurs with special paint, epoxy or non-sticking H.M.W. plastic sheets.
15. Odors generated at product storage site:
- Assure product is stored in well-drained area.
 - Assure no standing water is puddling around base of product pile.
 - Assure precipitation will drain from, not toward, the storage piles.
16. Dust escaping silo while unloading dust into silo.
- Make sure blower motor is switched on (if applicable) before unloading.
 Make sure shaker is working properly.
 Check filter bags.
 Check relief valve for proper seal.
 Refer to silo manufacturer manual.
 Check conveyors for build-up of material on rollers.
 Check operation of scraper on conveyor.

9.0 REFERENCES

9.1 Citations in this Manual

DHHS (NIOSH), Guidance for Controlling Risks to Workers Exposed to Class Biosolids, Preprint, Publication Number 2002-149, June 12, 2002.
(<http://www.cdc.gov/niosh/docs/prprint/pdfs/biosolidsb.pdf>).

New York State Department of Environmental Conservation (NYSDEC), Division of Solids & Hazardous Materials, Bureau of Waste Reduction & Recycling, Fact Sheet Number 1: Biosolids Recycling,
<http://www.dec.state.ny.us/website/dshm/redrecy/facts.pdf>, (Dec. 1999).

US Environmental Protection Agency (EPA), Control of Pathogens and Vector Attraction in Sewage Sludge, EPA/625/R-92-0 13, Revised October 1999.

9.2 Supplemental References and Assistance

Other information is available from the City's consultants who can provide assistance with daily operations, management, trouble shooting and product distribution.

9.3 Other Information

Other information is available, including a Safety Manual, intended to supplement the facility safety program, along with area-specific rules and regulations. The Safety Manual contains information on OSHA rules and regulations, hazard communication programs, confined space entry programs, respiratory protection programs fire prevention, lockout/tagout tips and laboratory safety.

Material Safety Data Sheets (MSDS) for Alkaline Treatment Soil and other materials used in the Alkaline Treatment process are provided in appendices.

Appendix A

Definitions

Definitions

Terms used for the N-Viro process include the following:

AA (Alkaline Admixture)

One, or a combination of, the alkaline by-products noted next.

Alkaline By-Product

Includes but is not limited to lime kiln dust (LKD), cement kiln dust (CKD), and fly ash (FA). Each of these materials has a significant calcium oxide content or equivalent, which result in exothermic heating and/or high surface area for drying and minimizing sludge odors.

Batch

Biosolids mixed with an AA and conveyed to a heat pulse pile.

Bulk Drying

When biosolids with a solids concentration $\geq 50\%$ are achieved by addition of a non-reactive or "cold" AA.

Heat Pulse Pile

A batch of mixed material that is monitored for process temperature, pH and solids concentration.

Shredding

Shredding is a process performed by devices such as soil shredders, which process finished product (at $> 50\%$ solids concentration), creating a final product with a uniform particle size.

Screening

The process of passing finished product (at $> 50\%$ solids concentration) through a mechanical screen, producing a final product with a consistent texture.

Appendix B

Metric to English and Other Conversions

Metric to English and Other Conversions

$$\text{mg/kg} \times 0.002 = \text{lbs./ton}$$

$$\text{e.g. TKN} = 10,500 \text{ mg/kg}$$

$$10,500 \times 0.002 = 21.0 \text{ lb/ton TKN}$$

$$\text{lb/ton phosphorus} \times 2.3 = \text{P}_2\text{O}_5$$

$$\text{lb/ton potassium} \times 1.3 = \text{K}_2\text{O}$$

$$\text{Fahrenheit to Centigrade: } \text{deg C} = 5/9 (\text{F}-32)$$

$$\text{Centigrade to Fahrenheit: } \text{deg F} = (\text{deg C} \times 9/5) + 32$$

Appendix C

Silo and Feeder Operation

Silo and Feeder Operation

Alkaline by-products are loaded into silos pneumatically. Occasionally, a silo may appear full even though there seems to be plenty of space for the material. Bag-house clogging, which increases air pressure, usually causes this phenomenon, resulting in accompanying alarms. The pressure indicator valve may also clog, with the same effect. Keeping the bag house in good working order and maintaining the air valve can reduce problems associated with loading and having to absorb the cost of handling unused portions of a delivery.

While it is infrequent for lime, occasionally tramp material can be present in alkaline admixtures. Most intake fittings have a screen to prevent this material from entering the silo. Some facilities have been so troubled with the clogging of these screens that the screens have been removed and anything that will pass through is allowed in the silo.

Note: Check the bulk density of AAs before loading into the silo.

Silo Loading

Note: For complete operation and safety information, refer to the manufacturer's manual for detailed instructions. The following information is generic, intended as a general guide to standard operating practices.

Shipments of AA are transported in pneumatic tank trailers and blown into the receiving silos by on-board compressors. The AA is usually blown from the truck into the silo through a four-inch pipeline equipped with a quick disconnect coupling.

The operator should determine if the bag house needs cleaning or shaking before and after each load of AA is received, clearing AA dust from the bag house filtering cloth. The Silo bag house should be on-line during loading. Proper operation (cleaning/shaking) of the bag house will prevent restriction of air discharge from the silo as the material is pneumatically discharged from the truck. (Please check the manufacturer's instructions.)

The operator should monitor the silo high level indicator during filling to prevent overloading the silo and potentially damaging the bag house and silo equipment.

Silo Level Monitoring

AA level indicators may be provided to alert the operator to:

1. High Silo level
2. Low Silo level

The operator should monitor the level indicators and contact the N-Viro Agent to order (if appropriate) AA at the proper time to prevent a shutdown.

Bag House Inspection

All AA silos are provided with a bag house to trap particulate matter while allowing air to discharge from the silo during pneumatic filling.

Bag shaking equipment should be periodically inspected to assure proper operation. Material should shake from the bags and fall back into the silo. Damaged or improperly secured bags should be repaired or replaced.

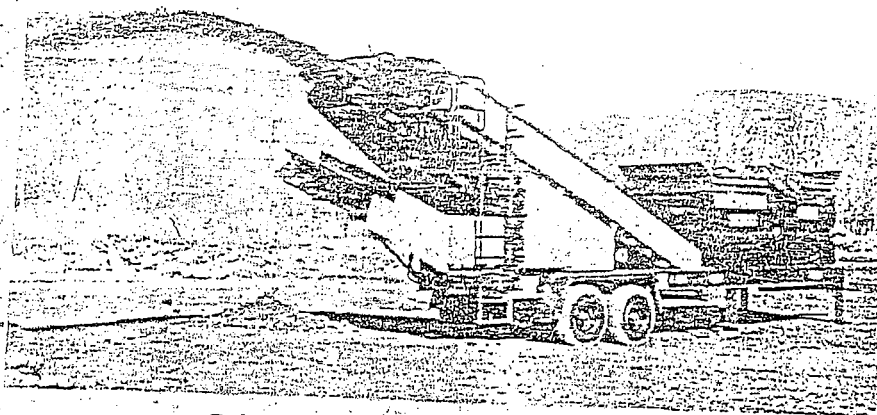
Alkaline Admixture Dosing/Metering Equipment Operation

AA typically is discharged from the silo through a positive isolation gate and a rotary vane feeder, into a screw conveyor to the mixing unit.

Air pads fluidize and promote materials flow from the silo. The air flow rate into the silo will affect the flow of AA into the mixing equipment. Caution must be exercised to minimize introduction of moisture into the silo through fluidization operations to prevent carbonation of calcium oxide, thereby reducing AA reactivity.

Appendix D
Shredder Information

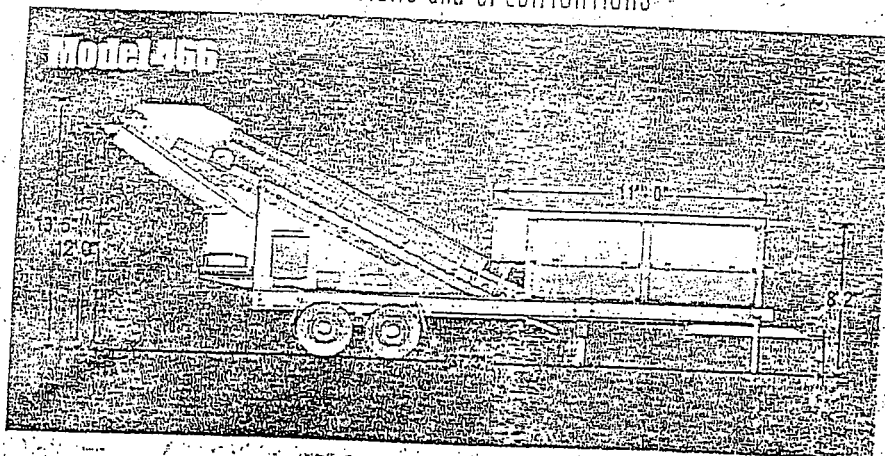
Model 466 Soil Shredder - Mixer



EQUIPMENT FOR PROCESSING SOIL, PEAT AND ORGANIC MATERIALS

For large scale soil processing and blending operations:
 Top Soil Manufacturing • Excavating Companies
 Municipalities

DIMENSIONS and SPECIFICATIONS



Standard Features

- Computer controlled soil shredder
- Self-regulating infeed and inclined conveyor
- Removable metal option available
- 1150 horsepower
- No transfer of material required

Specification	Model 466
Height	13' 5" / 12' 0"
Width	11' 0"
Length	8' 2"
Loading Height	
Discharge Height	
Hopper Capacity	
Receiving Hopper Opening	
Shredder Bolt Width	
Power Plant (John Deere)	
Horsepower	
Weight	
Transport	

Appendix E
Operations Recording Forms

DAILY DATA LOG

N-VIRO QUALITY CONTROL SHEET

Date: _____ Batch ID#: _____

Heat Pulse Location #: _____ Operator: _____

	Time: 0 Hours	Time: 8 Hours	Time: 12 Hours
Temperature Location 1			
Temperature Location 2			
Temperature Location 3			
Temperature Location 4			
Temperature Location 5			
pH, Composite			

N-VIRO SOIL BATCH FORM*

Date of Processing: _____

Wet Tons Processed: _____ tons

Incoming Sludge: _____ % Solids

Mixed Product _____ % Solids

Pile Location _____

Pile Moved: Date of Move _____, New Location: _____

Day	Date	Time	Temperature (deg C)	pH	% Solids
1					
2					
3					

Date of last shredding operation: _____

Date treatment finalized: _____

Date stockpiled (if stored on-site): _____

Date batch picked up and moved off-site: _____

Initials of technician certifying
treatment complete and pick-up: _____*Treatment requirements

Temperature > 52 deg C for at least 12 hours

pH > 12 for 72 hours

> 50 % solids

Time _____

NOTES:

[illegible]

FACILITY

Daily Report Form

Superintendent: _____
 Date: _____

Weather Conditions:

Wind Direction and Speed (am) _____ (pm) _____
 Temp. (am) _____ (pm) _____

Incoming Biosolids Inspection:

Temp. _____
 pH _____
 % Solids _____

Wet Tons Received	load #1 _____	load #2 _____	load #3 _____
per load	load #4 _____	load #5 _____	load #6 _____
	load #7 _____	load #8 _____	load #9 _____

Total Wet Tons _____
 Inspected By _____

Processing Inspection:

	After Blending	After 12 hr. Heat Pulse
pH	_____	_____
% Solids	_____	_____

Wet Tons . . . processed: _____
 Actual Operating Time: _____

AA Source:

Tons received	load #1 _____	load #1 _____	load #1 _____
	load #2 _____	load #2 _____	load #2 _____
	load #3 _____	load #3 _____	load #3 _____

Total Tons Received: _____

General Remarks:

Appendix F

Annual Report Form

Biosolids Processing Facility Annual Report
(Composting, Chemical stabilization, Heat drying, etc.)

Section 1
Owner/ Facility Information

Facility Name: _____

Mailing Address: _____

County: _____

Owner Name: _____ Tel: _____ E-mail: _____

Operator Name: _____ Tel: _____ E-mail: _____

DEC Region (1-9): _____ DEC Facility Code (e.g. 01C05 or 01U05) _____

Permit Expiration Date: _____

This report covers the period from _____ to _____

Section 2
Materials Input

Input Material	Quantity	Unit* (Circle one)	% Solids	Source
Biosolids (Sewage Sludge)		WT DT CY		
Bulking Agent/Amendment Specify: _____		WT DT CY		
Other: _____		WT DT CY		

* WT = wet tons DT = dry tons CY = cubic yards

Biosolids Processing Facility Annual Report

Section 3

Biosolids Analyses

Copies of original laboratory results must be attached.

All results, except pH and Total Solids, must be on a dry weight basis.

Analysis Date ==>					Avg.	Max.
Arsenic, ppm						
Cadmium, ppm						
Chromium, ppm						
Copper, ppm						
Lead, ppm						
Mercury, ppm						
Molybdenum, ppm						
Nickel, ppm						
Selenium, ppm						
Zinc, ppm						
TKN, ppm						
Ammonia-N, ppm						
Nitrate-N, ppm						
Total Phosphorus, ppm						
Total Potassium, ppm						
pH (s.u.)						
Total Solids(%)						
Total Volatile Solids(%)						

Section 4

Biosolids Processing Facility Annual Report

Finished Product Analyses

Copies of original laboratory results must be attached.

All results, except pH and Total Solids, must be on a dry weight basis

Analysis Date ==>					Avg.	Max.
Arsenic, ppm						
Cadmium, ppm						
Chromium, ppm						
Copper, ppm						
Lead, ppm						
Mercury, ppm						
Molybdenum, ppm						
Nickel, ppm						
Selenium, ppm						
Zinc, ppm						
TKN, ppm						
Ammonia-N, ppm						
Nitrate-N, ppm						
Total Phosphorus, ppm						
Total Potassium, ppm						
pH (s.u.)						
Total Solids(%)						
Total Volatile Solids(%)						
Fecal Coliform (MPN/g)						
Salmonella sp. (MPN/4g)						
Other _____						

Biosolids Processing Facility Annual Report

Section 5

Pathogen Reduction / Vector Attraction Reduction

Check one method for each:

Pathogen Reduction

- ☐ Windrow Composting
- ☐ Aerated Static Pile Composting
- ☐ In-vessel Composting
- ☐ Heat Drying
- ☐ Alternative 3 - pH / temp / drying
- ☐ Alternative 4 - product organism testing
- ☐ Other: _____

Vector Attraction Reduction

- ☐ Aerobic Process 14 days, 45 °C avg.
- ☐ 38 % Volatile Solids Reduction
- ☐ SOUR
- ☐ pH raised to 12 for 2 hours
- ☐ 75 % solids
- ☐ 90 % solids (untreated solids)
- ☐ Other: _____

Attach operating and monitoring data to show compliance with methods chosen.

Section 6

Sample Management

Attach a description of the number and position of all sampling locations, for both input material and compost. Describe why all samples are representative. Include a diagram showing all sampling locations.

Biosolids Processing Facility Annual Report

Section 7 **Product Generation**

What is the process detention time? _____ days

Quantity of product produced by facility: _____ dry tons
_____ cubic yards per report period

Quantity of product removed from facility: _____ dry tons per report period
_____ cubic yards per report period

Quantity currently stockpiled: _____ dry tons
_____ cubic yards

Age of oldest product stockpiled _____ months

Section 8 **Product Distribution**

Product Users	Quantity Taken (dry tons)	Actual Use of Product

Biosolids Processing Facility Annual Report

Section 9 **Problems / Complaints**

Describe any operational problems or complaints arising from the processing operation and include any methods used to remedy the situations. This should include odor complaints, marketing difficulties, equipment failure, etc.

Section 10 **Signature and Date**

I hereby swear or affirm that information provided on this form and attachments and exhibits is true to the best of my knowledge and belief.

_____	_____	_____
Name (Print or Type)	Signature	Date

Title: _____

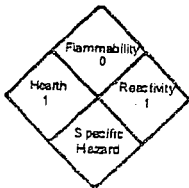
Address: _____

Phone: _____ E-mail: _____

Appendix G

Materials Safety Data Sheets

(Note: The following MSDSs are for lime and the AAs similar to those used at the facility.
Operations staff should request updated MSDSs from suppliers.



Calcium Oxide



Material Safety Data Sheet for Calcium Oxide

Section I - Identity

Manufacturer's name and address: Ash Grove Cement Company
8900 Indian Creek Parkway
P. O. Box 25900
Overland Park, KS 66225
Emergency Telephone Number: (913) 451-8900
Information Telephone Number: (913) 451-8900

Chemical Name and Synonyms: Calcium oxide, CaO, quicklime, lime, unslaked lime

Trade Name and Synonyms: Pebble Quicklime, Cal-Max

CAS No.: 1305-78-8

Date Revised: July 2000

Section II - Hazardous Ingredients

	CAS Number	OSHA PEL	ACGIH TLV
Quicklime, CaO	1305-78-8	5 mg/m ³	2 mg/m ³
Quartz, crystalline silica	14808-60-7	PEL = $\frac{10\text{mg/m}^3}{\% \text{SiO}_2^{*+2}}$	0.05 mg/m ³ *

Calcium oxide may contain greater than 0.1% quartz, crystalline silica. Chronic exposure above the allowed limit to the respirable dust of materials containing crystalline silica or quartz may cause silicosis.

*Respirable fraction

ACGIH American Conference of Governmental Industrial Hygienists
OSHA Occupational Safety and Health Administration
PEL Permissible Exposure Limit
TLV Threshold Limit Value

Section III - Chemical and Physical Data

Chemical Family: Inorganic Base Evaporation Rate: Not Applicable
Molecular Weight: 56.10
Boiling Point: 5162°C
Melting Point: 4737°F
Specific Gravity: 3.2-3.4
Vapor Density: (Air=1) Not Applicable
Solubility in Water: 0.131 g/100 ml at 10°C; 0.07 g/100 ml at 80°C
Appearance and Odor: White granular or powder; faint earthy odor

Section IV - Fire and Explosion Hazard Data

Flash Point: Not Applicable; calcium oxide is noncombustible and not explosive.

Flammable or Explosive Limits: Not Applicable LEL: Not Applicable UEL: Not Applicable

Extinguishing Media: Not Applicable

Special Fire Fighting Procedures: Calcium oxide in itself is incombustible. In contact with water, product will hydrate evolving heat. Warning: Sufficient heat can be created during hydration to ignite paper, wood, rags or other combustible materials. CAUTION: Saturated water solutions of calcium oxide can have pH of 12-12.49. See Section VII for appropriate precautions.

Firefighting Media: Dry chemical, flooding quantities of water as spray, foam. For larger fires, use water spray, fog or alcohol foam. DO NOT use carbon dioxide or halogenated extinguishing agents.

CAUTION: Saturated water solutions of hydrated lime can have pH of 12-12.49 at temperatures of 25°C or above. See Section VII for appropriate precautions.

Unusual Fire and Explosion Hazards: Heat generated from reaction with water can start fires.

Section V - Health Hazard Data

Calcium Oxide can contain quartz greater than 0.1%. Chronic exposure by inhalation to respirable size quartz dust at levels exceeding exposure limits has caused silicosis, a serious and progressive pneumoconiosis which can be disabling and in extreme instances, lead to death. Symptoms may appear at any time, even years after exposure has ceased. These symptoms may include shortness of breath, difficulty in breathing, coughing, diminished work capacity, reduction of lung volume and right heart enlargement and/or failure. The only reliable method of detecting silicosis is through a chest x-ray. Silicosis may aggravate other chronic pulmonary conditions and may increase the risk of pulmonary tuberculosis infection. Smoking aggravates the effects of silica exposure. The International Agency for Research in Cancer (IARC) has determined that quartz crystalline silica is carcinogenic to humans when inhaled from occupational sources.

Section V - Health Hazard Data - (Continued)

Route(s) of Entry: Inhalation; skin; eyes; ingestion

1. **Inhalation: corrosive**
 - a. **Acute exposure:** Inhalation of low concentrations may cause sore throat, coughing, choking, dyspnea, and variable symptoms of headache, dizziness, and weakness. Intense exposures may result in tightness in the chest and delayed pulmonary edema. The solubility of the substance allows further penetration that may continue for several days.
 - b. **Chronic exposure:** Bronchial irritation with chronic cough is common; chronic overexposure may result in silicosis.
 - c. **First aid:** Remove from exposure; move to fresh air immediately. Keep affected person warm and at rest. Get medical attention.
2. **Skin contact: corrosive**
 - a. **Acute exposure:** During prolonged skin contact the substance can penetrate the unprotected skin slowly, producing soft, necrotic, deeply penetrating areas on contact. The solubility allows further penetration that may continue for several days. The extent of damage depends on duration of contact.
 - b. **Chronic exposure:** A chronic dermatitis may follow repeated contact.
 - c. **First aid:** Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). In the case of chemical burns, cover the affected areas with sterile, dry dressing. Bandage securely, but not too tightly. Get medical attention.
3. **Eye contact: corrosive**
 - a. **Acute exposure:** Direct contact with the solid or aqueous solutions may cause conjunctival edema and corneal destruction which can lead to and may cause blindness.
 - b. **Chronic exposure:** Prolonged contact may cause conjunctivitis.
 - c. **First aid:** Wash eyes immediately with large amounts of water, occasionally lifting the upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately. Administration of drugs to the eyes should be performed by qualified medical personnel.
4. **Ingestion: corrosive.** If ingested, consult a physician immediately.

Calcium Oxide listed as an OSHA Carcinogenic: NO By NTP: NO By IARC: NO
 Quartz listed as an OSHA Carcinogen: NO By NTP: YES (Group 2A) By IARC: YES
 (Group 1)

Medical conditions generally aggravated by exposure: Respiratory disorders or diseases, dermatitis or other skin disorders may be aggravated by exposure.

Section VI - Reactivity Data

Stability: Reacts rapidly with water to produce heat and form calcium hydroxide. Will gradually react with the carbon dioxide in air to form calcium carbonate; stable in absence of moisture and carbon dioxide.

Conditions to avoid: Contact with water, acids.

Incompatibility (materials to avoid): May react violently and incandescently with boric oxide, hydrogen fluoride, phosphorous pentoxide, chlorine trifluoride, and fluorine. Reaction with halogenated compounds may cause ignition.

Hazardous Polymerization: Will not occur.

Hazardous Decomposition or By-Products: None.

Section VII - Precautions for Safe Handling and Use -

Saturated solutions of calcium oxide ("Milk of Lime") can have pH of 12-12.49 at 25°C or above, corrosive to unprotected skin and eyes. Such solutions may be created during fire fighting. Tight fitting goggles and gloves, boots and other personal protective equipment (PPE) must be used to prevent skin and eye contact. PPE resistant to permeation and penetration by lime water must be chosen.

Handling: Use protective equipment as described above in this section.

Storage: Protect product against physical damage and store in a dry place away from water or moisture.

Steps to be taken in case material is released or spilled:

Do not touch spilled material. Stop leak if possible without risk. For small spills, take up with absorbent material and place into containers for later disposal. For small dry spills, shovel material into clean, dry container and cover. Move containers from spill area. For large spills, dike far ahead of spill for later disposal. Dispose of in accordance with all local, state and federal requirements. Spills should not be flushed to surface waters or sewers.

Section VIII - Control Measures

Ventilation: Enclose all dusty processes; use local exhaust ventilation; use ventilation to vent dust to collector.

Personal Protective Equipment (PPE): Use a NIOSH-approved (42 CFR 84) respirator with dust filtering capability for protection against airborne calcium oxide.

Use gauntlet type work gloves and tight fitting goggles. Long sleeve shirts and long pants should be worn. Protective barrier creams may be used on exposed skin surfaces.

Refer to Section VII for protection against exposure to solutions of calcium oxide.

Work/Hygienic Practices: Immediately after working with calcium oxide, workers should shower with soap and water.

This product neither contains nor is directly manufactured with
any controlled ozone depleting substances, Class I and II.

Material Safety Data Sheet for Cement Kiln Dust

Section I - Identity

Manufacturer's name and address: Ash Grove Cement Company
8900 Indian Creek Parkway
P. O. Box 25900
Overland Park, KS 66225
Emergency Telephone Number: (913) 451-8900
Information Telephone Number: (913) 451-8900
Chemical Name and Synonyms: Cement Kiln Dust; CKD

Chemical Name and Synonyms: A mixture of sulfates, chlorides, carbonates, and oxides of sodium, potassium and calcium; quartz (CAS No. 01-4808-60-7), limestone (CAS No. 1317-65-3), fly ash, dolomite, feldspars, and iron oxides; glasses of silicon dioxide, aluminum oxide and iron oxide; and cement compounds (CAS No. 65997-15-1). Cement kiln dust (CKD) is a partially calcined mineral mixture collected by or in electrostatic precipitators (ESPs) or by other air pollution control devices (APCDs), and deposited in ESP collection bins.

When waste-derived fuels comprise a part of the fuel source, CKD may contain 200-2000 ppm lead and traces of other heavy metals, including, but not limited to, arsenic, chromium, cadmium, antimony, barium, beryllium, silver, mercury, thallium, selenium and nickel.

Calcium oxide may also be present in freshly generated CKD. If CKD is mixed with water, the calcium oxide will hydrate to form calcium hydroxide.

Revision Date: August, 2000

Section II - Hazardous Ingredients

	OSHA PEL	ACGIH TLV	Carcinogen Status
Inert or Nuisance Dust Respirable Fraction Total Dust	5 mg/m ³ 15 mg/m ³	3 mg/m ³ 10 mg/m ³	Not Applicable
Calcium oxide, Quicklime, CaO	5 mg/m ³	2 mg/m ³	Not Applicable
Hydrated Lime, Ca(OH) ₂ :Total: Respirable:	15 mg/m ³ 5 mg/m ³	5 mg/m ³ (Total)	Not Applicable
Respirable Quartz, Free Silica, SiO ₂	$\frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$	0.05 mg/m ³	NTP - Yes IARC - Yes OSHA - No
Total Quartz, Free Silica, SiO ₂	$\frac{30 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$	Not Applicable	NTP - Yes IARC - Yes OSHA - No

CKD contains greater than 0.1% crystalline silica.

Section II - Hazardous Ingredients (Continued)

Metals - Representative Exposure Limits			
	OSHA PEL	ACGIH - TLV	Carcinogen Status
Arsenic	0.01 mg/m ³	0.01 mg/m ³	OSHA - Yes IARC - Yes NTP - Yes
Chromium	1.0 mg/m ³	0.50 mg/m ³	OSHA - No IARC - Yes NTP - Yes
Cadmium	0.005 mg/m ³	0.01 mg/m ³	OSHA - Yes IARC - Yes NTP - Yes
Lead	0.05 mg/m ³	0.05 mg/m ³	OSHA - No IARC - Yes NTP - No
Antimony	0.50 mg/m ³	0.50 mg/m ³	OSHA - No IARC - No NTP - No
Barium	0.50 mg/m ³	0.50 mg/m ³	OSHA - No IARC - No NTP - No
Beryllium	2 μ g/m ³	0.002 mg/m ³	OSHA - No IARC - Yes NTP - Yes
Silver	0.01 mg/m ³	0.01 mg/m ³	OSHA - No IARC - No NTP - No
Mercury	C* = 0.1 mg/m ³	0.025 mg/m ³ SKIN **	OSHA - No IARC - Yes NTP - No
Thallium	0.1 mg/m ³	0.1 mg/m ³ , SKIN**	OSHA - No IARC - No NTP - No
Selenium	0.20 mg/m ³	0.20 mg/m ³	OSHA - No IARC - Yes NTP - Yes

Nickel	1 mg/m ³	0.1 mg/m ³	OSHA - No IARC - Yes NTP - Yes
--------	---------------------	-----------------------	--------------------------------------

*C = Ceiling

** SKIN = can be absorbed through skin

Section III - Physical/Chemical Characteristics

Chemical Family: Inorganic Base with mixed inorganic oxides and salts
Specific Gravity: 2.82
Vapor Pressure(mm Hg): N/A
Vapor Density: (Air=1) N/A
Evaporation Rate: NA
Solubility in Water: 1.0 to 12%
Appearance and Odor: Buff colored powder; odorless
Melting Point: N/A

Section IV - Fire and Explosion Hazard Data

Flash Point (method used): N/A; Cement Kiln Dust is non-combustible and not explosive.
Flammable or Explosive Limits: LEL: NA UEL: NA
Extinguishing Media: N/A
Special Fire Fighting Procedures: Cement Kiln Dust is incombustible
Firefighting Media: N/A

CAUTION: Saturated water solutions of cement kiln dust can have pH of 12-12.5. See Section VII for appropriate precautions.

Unusual Fire and Explosion Hazards: None

Section V - Health Hazard Data

Emergency Overview:

Cement Kiln Dust is a light gray powder that poses little immediate hazard. A single short exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet cement kiln dust can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry cement kiln dust.

Route(s) of Entry of cement kiln dust: Inhalation; skin; eyes; ingestion

1. Inhalation:

- a. **Acute exposure:** Freshly generated CKD may be corrosive to damp moist skin if calcium oxide and calcium hydroxide are present. Inhalation of this dust may cause sore throat, coughing, choking, and dyspnea.
- b. **Chronic exposure:** Bronchial irritation with chronic cough may occur. CKD can contain crystalline silica in the respirable size range of particulate. Chronic long term exposure to respirable crystalline silica without the use of a respirator can cause silicosis, a serious and progressive pneumoconiosis which can be disabling and in extreme instances lead to death. Symptoms may appear at any time, even years after exposure has ceased. These symptoms may include shortness of breath, difficulty breathing, coughing, diminished work capacity, reduction of lung volume and right

heart enlargement and/or failure. The only reliable method of detecting silicosis is through a chest x-ray. Silicosis may aggravate other chronic pulmonary conditions and may increase the risk of pulmonary tuberculosis infection. Smoking aggravates the effects of silica exposure. NTP and IARC list respirable quartz crystalline silica as a carcinogen; OSHA does not.

2. **Skin contact:**
 - a. **Acute exposure:** Freshly generated CKD may be corrosive in contact with unprotected skin, due to the content of calcium oxide and calcium hydroxide (lime). Solutions of lime can penetrate the skin slowly, producing soft, necrotic, deeply penetrating areas on contact; these are potentially serious burns. NOTE: CKD may also be shipped hot (approximately 200° F) and could cause thermal burns to unprotected skin.
 - b. **Chronic exposure:** A chronic dermatitis may follow repeated contact.
 - c. **First aid:** Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of CKD remains (approximately 15-20 minutes). In the case of chemical burns, due to the lime content of CKD, cover the affected areas with sterile, dry dressing. Bandage securely, but not too tightly. Get medical attention.
3. **Eye contact:** Freshly generated CKD may be corrosive to moist tissue around the eyes
 - a. **Acute exposure:** Direct contact with the freshly generated solid or aqueous solutions may cause conjunctival edema and/or corneal damage; can lead to and cause blindness.
 - b. **Chronic exposure:** Prolonged contact may cause conjunctivitis.
 - c. **First aid:** Wash eyes immediately with large amounts of water, occasionally lifting the upper and lower lids, until no evidence of CKD remains (approximately 15-20 minutes). Get medical attention immediately. Qualified medical personnel should perform administration of drugs to the eyes.
4. **Ingestion:** corrosive. If ingested, consult a physician immediately. Do not induce vomiting.

Hazard Information About Trace Metals in CKD:

Arsenic – Routes of entry: inhalation, absorption, skin and/or eye contact, ingestion. Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuritis, respiratory system irritation; hyperpigmentation of skin. Target organs are liver, kidneys, skin, lungs and lymphatic system. Arsenic is associated with lung and lymphatic cancer.

Chromium – Routes of entry: inhalation, ingestion, skin and/or eye contact. Chromium compounds are associated with eye irritation, allergic contact dermatitis and in some cases lung fibrosis. Target organs are the eyes, skin, and respiratory system.

Cadmium – Routes of entry: inhalation and ingestion. Cadmium dust may cause pulmonary edema and shortness of breath. Can result in cough, chest tightness, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, loss of the sense of smell, emphysema, proteinuria and mild anemia. The target organs are the respiratory system, kidneys, prostate and blood. Cadmium is associated with prostatic and lung cancer.

Lead – Routes of entry: inhalation, ingestion, skin and/or eye contact. Lead is associated with weakness, fatigue, insomnia, facial pallor, anorexia, low weight, constipation, abdominal pain, anemia, lead line on gums, tremors, wrist paralysis, brain alterations, kidney disease, eye irritation and hypotension. The target organs are the GI tract, CNS, kidneys, blood and gingival tissue.

Antimony – Routes of entry: inhalation, ingestion, skin and/or eye contact. Causes irritation of eyes, skin, nose, throat and mouth; dizziness; headache; nausea; vomiting; diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly. The target organs are the eyes, skin, respiratory system and CVS.

Barium – Routes of entry: inhalation, ingestion. Barium compounds can cause severe eye burns and skin irritation. It can cause muscle stimulation followed by paralysis with symptoms including nausea, vomiting,

Beryllium - Routes of entry: inhalation and skin and/or eye contact. Chronic exposure causes berylliosis: anorexia, low weight, weakness, chest pain, cough, clubbing of fingers, cyanosis, and pulmonary insufficiency; also causes eye irritation and dermatitis. The target organs are the eyes, respiratory system, and skin. Beryllium is associated with lung cancer.

Silver - Routes of entry: inhalation, ingestion, skin and/or eye contact. Can cause blue-gray discoloration of skin, eyes and mucous membranes; may cause irritation and ulceration of skin and GI tract disturbances. Target organs are nasal septum, skin and eyes.

Mercury - Routes of entry: inhalation, absorption, ingestion, skin and/or eye contact. Causes skin and eye irritation; cough, chest pain, shortness of breath, bronchial pneumonitis; tremors, insomnia, irritability, indecision, headache, fatigue, weakness, inflammation of the mouth, salivation, GI tract disturbances, anorexia, weight loss and protein in the urine.

Thallium - Routes of entry: inhalation, absorption, ingestion, skin and/or eye contact. Causes nausea and vomiting, diarrhea and abdominal pain; eyelid drooping, loss of binocular vision, peripheral neuritis, tremors; retrosternal tightness, chest pain, pulmonary edema; seizures, involuntary body movements, psychosis; liver and kidney damage; hair loss, tingling in the legs. Target organs are eyes, respiratory system, CNS, liver, kidneys, GI tract, body hair.

Selenium - Routes of entry: inhalation, ingestion, skin and/or eye contact. Causes eye, skin, nose and throat irritation; visual disturbances; headache; chills, fever; shortness of breath, bronchitis; metallic taste, garlic breath, GI tract disturbances; dermatitis; eye and skin burns. In animals causes: anemia; liver necrosis and cirrhosis; kidney and spleen damage. Target organs are the eyes, skin, respiratory system, liver, kidneys, blood, spleen.

Nickel - Routes of entry: inhalation, ingestion, skin and/or eye contact. Causes allergic dermatitis, allergic asthma, pneumonitis. Target organs are nasal cavities, lungs, skin. Nickel is associated with lung and nasal cancer.

Section VI - Reactivity Data

Stability: Calcium oxide and calcium hydroxide, if present in CKD, will gradually absorb carbon dioxide when exposed to air, forming calcium carbonate. Cement kiln dust consolidates when mixed with water. The resulting dry material sets loosely, preventing the material from becoming airborne. With excess water, calcium oxide and calcium hydroxide which may be present in freshly generated CKD can form a corrosive solution, pH 12-12.5.

Incompatibility (Materials to avoid): Contact with mineral acids will cause evolution of carbon dioxide with production of heat.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: Handling, conveying, or releasing CKD as a dry dusty solid. Wetting CKD prior to all handling will prevent the substance from becoming airborne.

Section VII - Precautions for Safe Handling and Use

Handling: Use protective equipment as described in Section VIII.

Storing: CKD should be wet by water spray when discharging from ESP bins to avoid generation of dust when conveying and depositing in landfill. No other precautions needed.

Section VIII - Control Measures

Respiratory Protection: A NIOSH approved (under 42 CFR 84) respirator must be used to control exposure below PELs and TLVs. Respirator must be effective in preventing exposure to respirable particulate composed of crystalline silica, lime and heavy metals at trace concentrations.

Firefighting: Self-contained breathing apparatus with a full facepiece operated in pressure-demand or positive-pressure mode.

Protective Gloves: Gauntlet type work gloves; if handling cement kiln dust in combination with water, chemical resistant gloves must be worn.

Eye Protection: When engaged in activities where cement kiln dust or wet cement kiln dust or concrete could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with wet cement kiln dust or fresh cement products.

Other Protective Equipment: Wear impervious clothing with long sleeves and pants to eliminate skin contact. If walking or working in dry or wet cement kiln dust, wear impervious boots taped at the top to the pant legs to keep dust or liquid from entering the boot. If clothing becomes saturated with wet CKD, it should be removed and replaced with clean dry clothing.

Work/Hygienic Practices: Immediately after working with cement kiln dust, workers should shower with soap and water.

This product neither contains nor is directly manufactured with any controlled ozone depleting substances, Class I and II.



Material Safety Data Sheet

[OSHA 29 CFR 1910.1200]

The QUIKRETE® Companies
2987 Clairmont Road, Suite 500
Atlanta, Georgia 30329

Emergency Telephone Number
(770) 216-9580

Information telephone Number
(770) 216-9580

Date of Preparation: August 2000

MSDS JJ

SECTION I: PRODUCT IDENTIFICATION

<u>QUIKRETE® Product Name</u>	<u>Code #</u>
FLY ASH	5009

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Fly ash composition is variable depending on coal source and power plant characteristics.
Fly ash has a respirable particle size distribution.

Component	Formula	OSHA PEL	ACGIH TLV	Typical %
Silica: Amorphous	SiO ₂	80mg/m ³ /(%SiO ₂)	10mg/m ³	16.6-45.6
Silica: Crystalline (Respirable)	SiO ₂	10mg/m ³ /(%SiO ₂ +2)	0.05 mg/m ³	3.4-9.4
Alumina (Respirable)	Al ₂ O ₃	5mg/m ³	5mg/m ³	10-35
Calcium Oxide	CaO	5mg/m ³	2mg/m ³	0.5-32
Titanium Dioxide (Respirable)	TiO ₂	5mg/m ³	5mg/m ³	0.33-2
Ferric Oxide	Fe ₂ O ₃	10mg/m ³	5mg/m ³	3-24
Magnesium Oxide	MgO	15mg/m ³	10mg/m ³	0.5-8

Materials present at less than 12% and greater than 0.5%, and not listed in OSHA or ACGIH include Potassium Oxide, Sodium Oxide, Sulfur Trioxide, and Carbon.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

<u>Boiling Point F:</u>	N/A	<u>pH:</u>	N/A
<u>Solubility in Water:</u>	N/A	<u>Specific Gravity:</u>	N/A
<u>Appearance and Odor:</u> Grayish white or black powder; odorless.			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Test Method): N/A
Flammable Limits in Air Percent by Volume: Lower: N/A Upper: N/A
Extinguishing Media: N/A
Special Fire Fighting: N/A
Unusual and Explosion Hazards: None

THE QUIKRETE COMPANIES

QUIKRETE® MATERIAL SAFETY DATA SHEET

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Product: Fly Ash

MSDS JJ

SECTION V - REACTIVITY DATA

Stability: Stable Conditions to Avoid: None known.
Incompatibility (Materials to Avoid): None known.
Hazardous Decomposition or Byproducts: None known.
Hazardous Polymerization: Will Not Occur Conditions to Avoid: None known.

SECTION VI - HEALTH HAZARD DATA

Effects of Overexposure: Acute - Irritation of eyes, skin and mucous membranes.
 Chronic - Fibrotic diseases of the lungs and potential carcinogenicity.
Emergency and First Aid Procedures: Skin: Wash with mild soap and water.
 Ingestion: Keep warm, at rest, and drink large amounts of water.

See Physician.

Eyes: Flush with water for 15 minutes. See Physician.

Inhalation: Move to fresh air.

Medical Conditions Aggravated by Exposure: Persons with history of respiratory illness and reduced pulmonary function should avoid work places with high dust levels. Persons with skin disorders may experience aggravation of the condition.

Chronic Exposure: Dust can cause inflammation of the lining tissue of the interior of the nose and inflammation of the cornea. Hypersensitive individuals may develop an allergic dermatitis. Fly ash contains a small percentage of respirable crystalline silica. Respirable crystalline silica (quartz) can cause silicosis, a fibrosis (scarring) of the lungs and possibly cancer. There is evidence that exposure to respirable silica or the disease silicosis is associated with an increased incidence of Scleroderma, tuberculosis and kidney disorders.

Carcinogenicity Listings:

NTP:	Known carcinogen
OSHA:	Not listed as a carcinogen
IARC Monographs:	Group 1 Carcinogen
California Proposition 65:	Known carcinogen

NTP: The National Toxicology Program, in its "Ninth Report on Carcinogens" (released May 15, 2000) concluded that "Respirable crystalline silica (RCS), primarily quartz dusts occurring in industrial and occupational settings, is *known to be a human carcinogen*, based on sufficient evidence of carcinogenicity from studies in humans indicating a causal relationship between exposure to RCS and increased lung cancer rates in workers exposed to crystalline silica dust (reviewed in IAC, 1997; Brown *et al.*, 1997; Hind *et al.*, 1997)

IARC: The International Agency for Research on Cancer ("IARC") concluded that there was "*sufficient evidence* in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is "*sufficient evidence* in experimental animals for the carcinogenicity of quartz or cristobalite." The overall

QUIKRETE® MATERIAL SAFETY DATA SHEET

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Product: Fly Ash

MSDS JJ

IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is *carcinogenic to humans* (Group 1)." The IARC evaluation noted that "carcinogenicity was not detected in all industrial circumstances or studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." For further information on the IARC evaluation, see IARC Monographs on the Evaluation of carcinogenic Risks to Humans, Volume 68, "Silica, Some Silicates..." (1997)

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Materials Released or Spilled: Clean up material for use or disposal. Dampen with a water mist to control dust (airborne dust) before removal. Do not use compressed air. If loaded on trucks, wet down ash to prevent dusting during transport.

Waste Disposal Method: The packaging and material may be land filled; however, material should be covered to minimize generation of airborne dust. This product is not classified as a hazardous waste under RCRA or CERCLA.

SECTION VIII - CONTROL MEASURES

DO NOT BREATHE DUST. In dusty environments, the use of an OSHA, MSHA or NIOSH approved respirator and tight fitting goggles is recommended. Local exhaust can be used, if necessary, to control airborne dust levels.

Ventilation: Local Exhaust: When feasible, use dust collector.

Protective Gloves: Normal work gloves.

Eye Protection: Safety goggles in dusty operations.

Other Protective Equipment: Recommended coveralls in high concentration conditions.

SECTION IX - SPECIAL PRECAUTIONS

Handling and Storage: Store in dry conditions.

Other Precautions: Avoid creating dust and practice good hygiene; wash hands and face prior to eating and drinking.

WARN EMPLOYEES AND/OR CUSTOMERS OF THE HAZARDS AND REQUIRED OSHA PRECAUTIONS ASSOCIATED WITH THE USE OF THIS PRODUCT.

NOTE: The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind expressed or implied is made with respect to the information contained herein.

PETERS CHEMICAL COMPANY

Please be sure to inquire about our early order and truckload specials on Ice Melter Product

HOME

MATERIAL SAFETY DATA SHEET

Contact Us

Product Name: Calcium Oxide (Lime Kiln Dust)

Calcium
Oxide

EPA Reg. No: N/A

Calcium
Hydroxide

1. PRODUCT IDENTIFICATION

Lime Kiln
Dust

Product Name.....Lime Kiln Dust (Calcium Oxide)

UN/MA#.....N/A

Calcium
Chloride

DOT Hazard Class.....N/A

Magnesium
Chloride

2. TYPICAL CHEMICAL COMPOSITION

Recommended Exposure Limits

Sodium
Acetate

Hazardous Components CAS Number OSHA PEL ACGIH TLV-TWA

Calcium
Magnesium
Acetate

Mg/m³

Mg/m³

Calcium Oxide 1305-78-8 5 5

Magnesium Oxide 1309-48-4 10 (fume) 10 (fume)

Potassium
Chloride

Calcium Carbonate 1317-65-3 15 15

Urea

Silica 7631-86-9 80/(%SiO₂) 5

Ice Melter
Blends

3. PHYSICAL DATA

Boiling Point.....N/A

Sodium
Chloride

Melting Point.....1076 F

Fertilizers

Vapor Pressure..... N/A

PCCAgricultural
Limestone

Vapor Density.....N/A

pH.....Basic

SevenThingsFacilityManagersMust KnowAbout IceMelters!!!

Solubility in Water.....Appreciable, greater than 10%

Evaporation Rate.....N/A

Appearance and Odor.....Soft, white crystalline powder;
OdorlessDECLARINGWAR on ICE(Productknowledgecan help findthe "right"weapons)**4. FIRE AND EXPLOSION HAZARD DATA**

Flash Point.....N/A

Flammable Limits.....N/A

Fire Extinguishing Media.....Considered non-combustible. Use
media appropriate for surrounding fire.Break the Ice(comparisonof Ice MeltingChemicals)Special Fire Fighting Procedures.....Avoid water unless necessary to use
on other burning materials in which case the area should be flooded with
water to absorb heat from the chemical reaction. Fire fighters should wear
full protective clothing and self-contained breathing apparatus.Unusual Fire and Explosion Hazards....Not combustible, but contact with
water may generate sufficient heat from the chemical reaction to ignite
combustible materials.**5. REACTIVITY DATA**

Stability.....Stable

Incompatibility.....Acids. Boric Acid +Calcium
Chloride (fused). Bromine Pentafluoride, Chlorine Trifluoride, Ethanol,
Fluorine, Hydrogen Fluoride, Interhalogen compounds. Organic materials,
and Phosphorus Pentoxide.

Hazardous Decomposition Products.....None expected

Hazardous Polymerization.....Will not occur

Conditions to Avoid.....N/A

6. SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released: In case of release to the environment, report spills to the National Response Center 1-800-424-8802

Suggested Local Action: Contain spill. Prevent large quantities from contacting vegetation or domestic and natural water sources. If material is not contaminated place in appropriate DOT approved containers for disposal.

Waste Disposal Method: (ERA Waste Identification #: N/A) If contaminated with other materials, the nature and extent of contamination may require the use of specialized disposal methods. If Steps to be taken in case material is released: In case of release to the environment, report spills to the National Response Center 1-800-424-8802

Suggested Local Action: Contain spill. Prevent large quantities from contacting vegetation or domestic and natural water sources. If material is not contaminated place in appropriate DOT approved containers for disposal.

Waste Disposal Method: (ERA Waste identification #: N/A) If contaminated with other materials, the nature and extent of contamination may require the use of specialized disposal methods. If disposal is necessary, comply with all local, state, and federal regulations. Contact your local EPA office for help.

For Hazardous Waste Regulation: call 1-800-424-9346 - The RCRA Hotline.

7. HEALTH HAZARD DATA

Inhalation: Extremely high concentrations of dust are typically self-eliminated due to the nuisance conditions they create. Over exposure may produce irritation of the mucous membranes, nose, throat, coughing and shortness of breath. In addition it may contain small amounts of silica particles less than 5mm in diameter. These silica particles are capable of causing silicosis if inhaled in high enough concentrations over an extended period of time. The principal manifestation of silicosis is difficulty in breathing. This condition can progress to dry cough, shortness of breath on exertion, decreased lung function and pulmonary fibrosis.

Skin Contact: May cause irritation, particular on damp skin. Repeated or prolonged contact could lead to dermatitis. Wash affected area with mild soap and water.

Eye Contact: May cause irritation and conjunctivitis. Flush with large amounts of water for at least 15 minutes, while rolling eyeball and lifting eyelid. Get medical attention.

Ingestion: Give milk, egg whites, or water to drink. DO NOT induce vomiting. Get medical attention.

8. EMERGENCY AND FIRST AID PROCEDURE

Inhalation: Remove from exposure, if breathing is difficult or has stopped, administer artificial respiration or oxygen as indicated. Immediately seek medical aid.

Skin Contact: Wash thoroughly with soap and water. Seek medical aid.

Eye Contact: Flush immediately with large amounts of water, lifting the lower and upper lids occasionally. Seek medical help.

Ingestion: Give 1 -2 large glasses of water or milk. Immediately seek medical aid. Never give liquids to an unconscious person.

Carcinogenicity: Not listed as a carcinogen by NTP, IARC, or OSHA.

Routes of Entry: Inhalation, Skin and Eye Contact if handled in such a manner that dust is generated.

Effects of Overexposure: As sold, this product is not anticipated to pose an acute or significant health hazard. However, if subjected to dust generating processes, adverse health effects may occur.

Calcium oxide is caustic to living tissue. Overexposure may cause irritation of the eyes, skin, and upper respiratory tract. Inflammation of the respiratory tract, ulceration and perforation of the nasal septum, bronchitis and pneumonia have also been attributed to inhalation of calcium oxide dust. Eye contact may cause conjunctivitis, corneal ulceration. Skin contact may cause skin inflammation and ulceration.

Medical Conditions Aggravated by Exposure: Chronic disease and disorders of the respiratory system and skin.

9. SPECIAL PROTECTION INFORMATION

Respiratory: Respiratory protection approved by NIOSH/MSI-IA for protection against dust should be used to avoid inhalation. Appropriate respiration selection depends on the type and magnitude of exposure.

Skin: Clean, body-covering clothing should be worn to prevent irritation in situation where direct contact with product may occur or dust levels are excessive.

Eyes: Employees should be required to wear chemical safety splash goggles in situations where direct contact with the product may result in

eye injury.

Ventilation: Local exhaust ventilation should be used to control worker exposure to below recommended Permissible Exposure Levels (PEL).

Other Protective Equipment: Emergency eye wash stations and deluge safety showers should be available in the work areas.

10. SPECIAL PRECAUTIONS

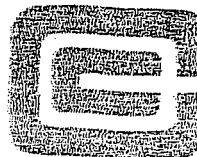
Precaution to be taken in handling and storage: Store in a cool, dry location. Keep out of reach of children and pets.

THIS INFORMATION IS TAKEN FROM SOURCES OR BASED UPON DATA BELIEVED TO BE RELIABLE; HOWEVER, PETERS CHEMICAL COMPANY, MAKES NO WARRANTY AS TO THE ABSOLUTE CORRECTNESS OR SUFFICIENCY OF ANY OF THE FOREGOING OR THAT ADDITIONAL OR OTHER MEASURES MAY NOT BE REQUIRED UNDER PARTICULAR CONDITIONS.

THIS DOCUMENT HAS BEEN PREPARED SOLELY FOR THE INTENT OF COMPLIANCE WITH THE PROVISIONS OF SUBPART 2 OF PART 1910 OF TITLE 29 OF THE CODE OF FEDERAL REGULATION, PARAGRAPH 1910.1200 AND CHAPTER 307 OR PART XIII OF THE PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, SECTION 17 OF (P.I. 734, NO. 159) (35 P.S. & 7317).



Send mail to webmaster@peterschemical.com with questions or comments about this web site.



MATERIAL SAFETY DATA SHEET

Lime Kiln Dust

STATEMENT OF HAZARDOUS NATURE

This product is classified as hazardous according to criteria of Worksafe Australia

Cockburn Cement Limited
Russell Road
Munster
P.O. Box 38
Hamilton Hill
WESTERN AUSTRALIA 6163
Phone: (08) 9411 1000

IDENTIFICATION

Product name:	Lime Kiln Dust
Other names:	LKD, G-Lime
UN number:	1910
Dangerous goods class and subsidiary risk:	none allocated
Hazchem code:	none allocated
Poisons schedule number:	none allocated
Use:	Lime Kiln Dust is used predominantly for acid neutralisation. G-Lime (hydrated & pelletised LKD) is used in agriculture for soil neutralisation.

Physical Description/Properties:

Appearance:	Grey amorphous powder (or pellets).
Boiling point / melting point:	Not applicable
Vapour pressure:	not applicable
Specific gravity:	2600 - 3000 kg/m ³
Flashpoint:	not applicable
Flammability limits:	not applicable

Solubility in water: Sparingly soluble in water.

OTHER PROPERTIES:

pH: Approximately 12
Other: Non combustible, not explosive, no odour.

Composition:

Chemical Name:	CAS number:	Proportion:
Calcium carbonate (CaCO_3)	1317-65-3	30 – 50%
Calcium oxide (CaO)	1305-78-8	30 – 50%
Magnesium oxide (MgO)	1309-48-4	0 – 3%
Silicon dioxide (SiO_2)	14808-60-7	0 – 1%
Aluminium oxide (Al_2O_3)		0.2 – 0.4%
Iron Oxide (Fe_2O_3)		0.1 – 0.3%

HEALTH HAZARD INFORMATION**HEALTH EFFECTS**

Acute: (effects may occur immediately or shortly after a single exposure)

Swallowed: Has a caustic reaction and will burn mouth and throat. Irritation of stomach may cause pain and nausea.

Eyes: Irritating, may result in burns to the eye and eyelids. Permanent damage is possible with prolonged exposure.

Skin: Irritating, rash and burns or dermatitis may occur.

Inhaled: Can burn the mucous membranes of the nose, mouth and throat. Chest discomfort and bronchitis may occur.

FIRST AID

Swallowed: Do not induce vomiting. Wash mouth and lips with copious amounts of water and give limited amounts of water or milk to drink. Seek urgent medical attention.

Eyes: Wash dust from around eyes. Flush with copious water for 10 minutes. Seek medical attention.

Skin: Quickly but gently wipe material off the skin. Immediately remove all contaminated clothing, including footwear. Wash effected areas thoroughly with plenty of soap and water. If any effects persist, seek medical attention.

- Inhaled:** Leave dusty area, seek medical attention if symptoms do not resolve quickly.
- First Aid Facilities:** Eye wash station.
- Advice to Doctor:** Contact POISONS INFORMATION CENTRE on (08) 9381 1177 or country 1800 119 244.

PRECAUTIONS FOR USE

- Exposure standards:** Worksafe Australia Exposure Standard:
- Calcium Oxide: 2 mg/m³.

Manufacturers' recommendations:

Keep exposure to dust as low as practicable.

If inspirable dust levels are kept below 2 mg/m³, health problems such as skin, eye and respiratory irritation will be minimised.

Engineering controls:

Avoid generating dust. All work with LKD should be carried out in such a way as to minimise exposure to dust and repeated skin contact. Where dust could be generated whilst handling LKD, use local mechanical ventilation or extraction in areas where dust could escape into the work environment. For bulk deliveries, closed pumping systems are recommended. Work areas should be cleaned regularly by vacuuming. If generating dust cannot be avoided, see personal protection recommendations below.

Personal protection:

Skin: Wear loose comfortable protective clothing and impervious boots. Apply barrier cream to hands or wear gloves (AS 2161). Wash thoroughly after handling. Wash work clothes regularly.

Eyes: Tight fitting dust goggles are advised to be worn.

Respiratory: If dust is generated wear a class P1 or P2 particulate respirator (AS/NZS 1715 & 1716). Use only respirators that bear the Australian Standards mark and are fitted correctly. Note that persons with facial hair will have difficulty in obtaining a satisfactory face seal. For alternatives see AS/NZS 1715: *Selection and use of respiratory protective devices*.

Flammability: LKD is not flammable but may generate heat on contact with water.

SAFE HANDLING INFORMATION

Storage and transport:

LKD should be stored in a cool protected place, away from strong oxidants or acids. Transportation is usually in bulk rail or road tankers.

Spills and disposal:

Spills may be cleaned up by any dry method such as broom and shovel or vacuum device, by suitably attired personnel. Residual material may be washed into a drain with sufficient water, preferably recycled.

Fire/explosion hazard:

Non-combustible.

Other Information:

LKD is non-combustible. Violent reaction with maleic anhydride, nitroethane, nitromethane, nitroparaffin, nitropropane and phosphorous.

CONTACT POINT

For further information on this product, contact:

Marketing and Technical Services
Cockburn Cement Limited
P.O. Box 38
Hamilton Hill
WESTERN AUSTRALIA 6163
Phone: (08) 9411 1000

Advice Note:

The information in this document is believed to be accurate. Please check the currency of this MSDS by contacting (08) 9411 1000.

The provision of this information should not be construed as a recommendation to use this product in violation of any patent rights or in breach of any statute or regulation. Users are advised to make their own determination as to the suitability of this information in relation to their particular purposes and specific circumstances. Users should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace and in conjunction with other substances or products.

Appendix H

Basic Hygiene Precautions for Handling Biosolids

Basic Hygiene Precautions for Handling Biosolids

The following information is abstracted from DHHS (2002).

Basic hygiene precautions are important for workers handling biosolids. The following list, originally developed by EPA, provides a good set of hygiene recommendations.

- 1) Wash hands thoroughly with soap and water after contact with biosolids.
- 2) Avoid touching face, mouth, eyes, nose, genitalia, or open sores and cuts while working with biosolids.
- 3) Wash your hands before you eat, drink, smoke, and before and after using the bathroom.
- 4) Eat in designated areas away from biosolids handling activities.
- 5) Do not smoke or chew tobacco or gum while working with biosolids.
- 6) Use barriers between skin and surfaces exposed to biosolids.
- 7) Remove excess biosolids from footgear prior to entering a vehicle or a building.
- 8) Keep wounds covered with clean, dry bandages.
- 9) Flush eyes thoroughly, but gently, if biosolids contact eyes.
- 10) Change into clean work clothing on a daily basis and reserve footgear for use at work site or during biosolids transport.
- 11) Do not wear work clothes home or outside the work environment.
- 12) Use gloves to prevent skin abrasion.

Additionally, NIOSH recommends the following steps to provide a more comprehensive set of precautions for use by employers and employees:

Provide appropriate protective equipment, hygiene stations, and training

Personal Protective Equipment (PPE) - Appropriate PPE should be provided for all workers likely to have exposure to biosolids. The choices of PPE include goggles, splash-proof face shields, respirators, liquid-repellant coveralls, and gloves. Face shields should be made available for all jobs where there is a potential for exposure to spray or high-pressure leaks, or aerosolized biosolids during land application. Management and employee representatives should work together to determine which job duties are likely to result in this type of exposure, to conduct appropriate on-site monitoring, and to determine which type of PPE is needed in conjunction with a qualified health and safety professional. If respirators are needed, a comprehensive program would include respirator fit testing and training or retraining.

Hygiene and Sanitation - Hand-washing stations with clean water and mild soap should be readily available whenever contact with biosolids occurs. In the case of

workers in the field, portable sanitation equipment including clean water and soap should be provided. Cabs should be wiped down and cleaned of residual mud (or settled dust) frequently to reduce potential exposure to biosolids.

Training - Periodic training on standard hygiene practices for biosolids workers should be conducted by qualified safety and health professionals that covers issues such as:

- frequent and routine hand washing (the most valuable safeguard in preventing infection by agents present in biosolids), especially before eating or smoking;
- the proper use of appropriate PPE, such as coveralls, boots, gloves, goggles, respirators, and face shields;
- the removal of contaminated PPE and the use of available on-site showers, lockers, and laundry services;
- proper storage, cleaning, or disposal of contaminated PPE;
- instructions that work clothes and boots should not be worn home or outside the immediate work environment.
- prohibition of eating, drinking, or smoking while working in or around biosolids.
- procedures for controlling exposures to chemical agents that may be in biosolids.

Reporting - Workers should be trained to report potentially work-related illnesses or symptoms to the appropriate supervisory or healthcare staff. This may aid in the early detection of work-related health effects.

Immunizations - Ensure that all employees are up-to-date on tetanus-diphtheria immunizations, since employees are at risk of soil-contaminated injuries. Current CDC recommendations do not support hepatitis A vaccination for sewage workers.

Appendix I

Group C Parameters

360-5.10 TABLES

Table 1
Parameters for Analysis - Biosolids/Sludge

<u>Group A</u>	<u>Group B</u>	<u>Group C</u>
Total Kjeldahl Nitrogen	Arsenic	Extended
Ammonia	Cadmium	Parameters
Nitrate	Chromium (total)	(see Table 2)
Total Phosphorous	Copper	
Total Potassium	Lead	
pH	Mercury	
Total Solids	Molybdenum	
Total Volatile Solids	Nickel	
	Selenium	
	Zinc	

Table 2
Extended Parameters List

VOLATILE ORGANIC COMPOUNDS		
	POLLUTANT	CAS
1	Acrolein	107-02-8
2	Acrylonitrile	107-13-1
3	Benzene	71-43-2
4	Bromoform	75-25-2
5	Carbon tetrachloride	56-23-5
6	Chlorobenzene	108-90-7
7	Chlorodibromomethane	124-48-1
8	Chloroethane	75-00-3
9	2-chloroethylvinyl ether	110-75-8
10	Chloroform	67-66-3
11	Dichlorobromomethane	75-27-4
12	1,1-dichloroethane	75-34-3
13	1,2-dichloroethane	107-06-2
14	Trans-1,2-dichloroethylene	156-60-5
15	1,1-dichloroethylene	75-35-4
16	1,2-dichloropropane	78-87-5
17	1,3-dichloropropene	542-75-6
18	Ethylbenzene	100-41-4
19	Methyl bromide	74-83-9
20	Methyl chloride	74-87-3
21	Methylene chloride	75-09-2

Table 2 (con't)

22	1,1,2,2-tetrachloroethane	79-34-5
23	Tetrachloroethylene	127-18-4
24	Toluene	108-88-3
25	1,1,1-trichloroethane	71-55-6
26	1,1,2-trichloroethane	79-00-5
27	Trichloroethylene	79-01-6
28	Vinyl chloride	75-01-4
ACID-BASE-NEUTRAL COMPOUNDS		
	POLLUTANT	CAS
	* Acid-extractable compounds	
1	4-chloro-3-methylphenol	59-50-7
2	2-chlorophenol	95-57-8
3	2,4-dichlorophenol	120-83-2
4	2,4-dimethylphenol	105-67-9
5	4,6-dinitro-2-methylphenol	534-52-1
6	2,4-dinitrophenol	51-28-5
7	2-nitrophenol	88-75-5
8	4-nitrophenol	100-02-7
9	Pentachlorophenol	87-86-5
10	Phenol	108-95-2
11	2,4,6-trichlorophenol	88-06-2
	*Base-Neutral compounds	
12	Acenaphthene	83-32-9
13	Acenaphthylene	208-96-8
14	Anthracene	120-12-7
15	Benzidine	92-87-5
16	Benzo(a)anthracene	56-55-3
17	Benzo(a)pyrene	50-32-8
18	Benzo(b)fluoranthene	205-99-2
19	Benzo(g,h,i)perylene	191-24-2
20	Benzo(k)fluoranthene	207-08-9
21	Bis(2-chlorethoxy)methane	111-91-1
22	Bis(2-chloroethyl) ether	111-44-4
23	Bis(2-chloroisopropyl) ether	108-60-1
24	Bis(2-ethylhexyl) phthalate	117-81-7
25	4-bromophenyl phenyl ether	101-55-3
26	Butyl benzyl phthalate	85-68-7
27	2-chloronapthalene	91-58-7
28	4-chlorophenyl phenyl ether	7005-72-3
29	Chrysene	218-01-9
30	Di-n-butyl phthalate	84-74-2
31	Di-n-Octyl phthalate	117-84-0
32	Dibenzo(a,h)anthracene	95-50-1
33	1,2-dichlorobenzene	53-70-3
34	1,3-dichlorobenzene	541-73-1

Table 2 (con't)

37	Diethyl phthalate	84-66-2
38	Dimethyl phthalate	131-11-3
39	2,4-dinitrotoluene	121-14-2
40	2,6-dinitrotoluene	606-20-2
41	1,2-diphenylhydrazine	122-66-7
42	Fluoranthene	206-44-0
43	Fluorene	86-73-7
44	Hexachlorobenzene	118-74-1
45	Hexachlorobutadiene	87-68-3
46	Hexachlorocyclopentadiene	77-47-4
47	Hexachloroethane	67-72-1
48	Indeno(1,2,3-cd)pyrene	193-39-5
49	Isophorone	78-59-1
50	Naphthalene	91-20-3
51	Nitrobenzene	98-95-3
52	N-nitrosodipropylamine	621-64-7
53	N-nitrosodimethylamine	62-75-9
54	N-nitrosodiphenylamine	86-30-6
55	Phenanthrene	85-01-8
56	Pyrene	129-00-0
57	1,2,4-trichlorobenzene	120-82-1
PESTICIDES/PCBs		
	POLLUTANT	CAS
1	Aldrin	309-00-2
2	Alpha-BHC	319-84-6
3	Beta-BHC	319-85-7
4	Delta-BHC	319-86-8
5	Gamma-BHC [Lindane]	58-89-9
6	Alpha-chlordane	5103-71-9
7	Gamma-chlordane	5103-74-2
8	4,4'-DDD [p,p'-TDE]	72-54-8
9	4,4'-DDE [p,p'-DDX]	72-55-9
10	4,4'-DDT	50-29-3
11	Dieldrin	60-57-1
12	Alpha-endosulfan	959-98-8
13	Beta-endosulfan	33213-65-9
14	Endosulfan sulfate	1031-07-8
15	Endrin	72-20-8
16	Endrin aldehyde	7421-93-4
17	Heptachlor	76-44-8
18	Heptachlor epoxide	1024-57-3
19	PCB-1016 (Arochlor 1016)	12674-11-2
20	PCB-1221 (Arochlor 1221)	11104-28-2
21	PCB-1232 (Arochlor 1232)	11141-16-5
22	PCB-1242 (Arochlor 1242)	53469-21-9
23	PCB-1248 (Arochlor 1248)	12672-29-6
24	PCB-1254 (Arochlor 1254)	11097-69-1
25	PCB-1260 (Arochlor 1260)	11096-82-5
26	Toxaphene	8001-35-2

Table 2 (con't)

	POLLUTANT	CAS
1	Antimony	7440-36-0
2	Beryllium	7440-41-7
3	Silver	7440-22-4
4	Thallium	7440-28-0
5	Cyanide	57-12-5

Table 3
Analyses Required with Permit Application

Biosolids/Sludge Used (dry tons/year)	Minimum Number of Analyses	
	Groups A & B	Group C
>1000	6	1
200 to 1000	3	1
25 to 199	2	1
<25	1	0

Table 4
Pollutant Limits - Class B Materials & Input To Class A Facilities

Parameter	Monthly Average Concentration mg/kg, dry weight	Maximum Concentration mg/kg, dry weight
Arsenic (As)	41	75
Cadmium (Cd) *	21	85
Chromium (Cr-total)	1000	1000
Copper (Cu)	1500	4300
Lead (Pb)	300	840
Mercury (Hg)	10	57
Molybdenum (Mo)	40	75
Nickel (Ni)	200	420
Selenium (Se)	100	100
Zinc (Zn)	2500	7500

* if the monthly average cadmium concentration exceeds 5 ppm, dry weight basis, the cadmium/zinc ratio must not exceed 0.015